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REPORT
1986-1987

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BRIEFING

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132 Legislature Building, Edmonton, Alberta, Canada T5K 2B6 403/427-2391

The Honourable David J. Carter
Office of the Speaker
Legislative Assembly of Alberta

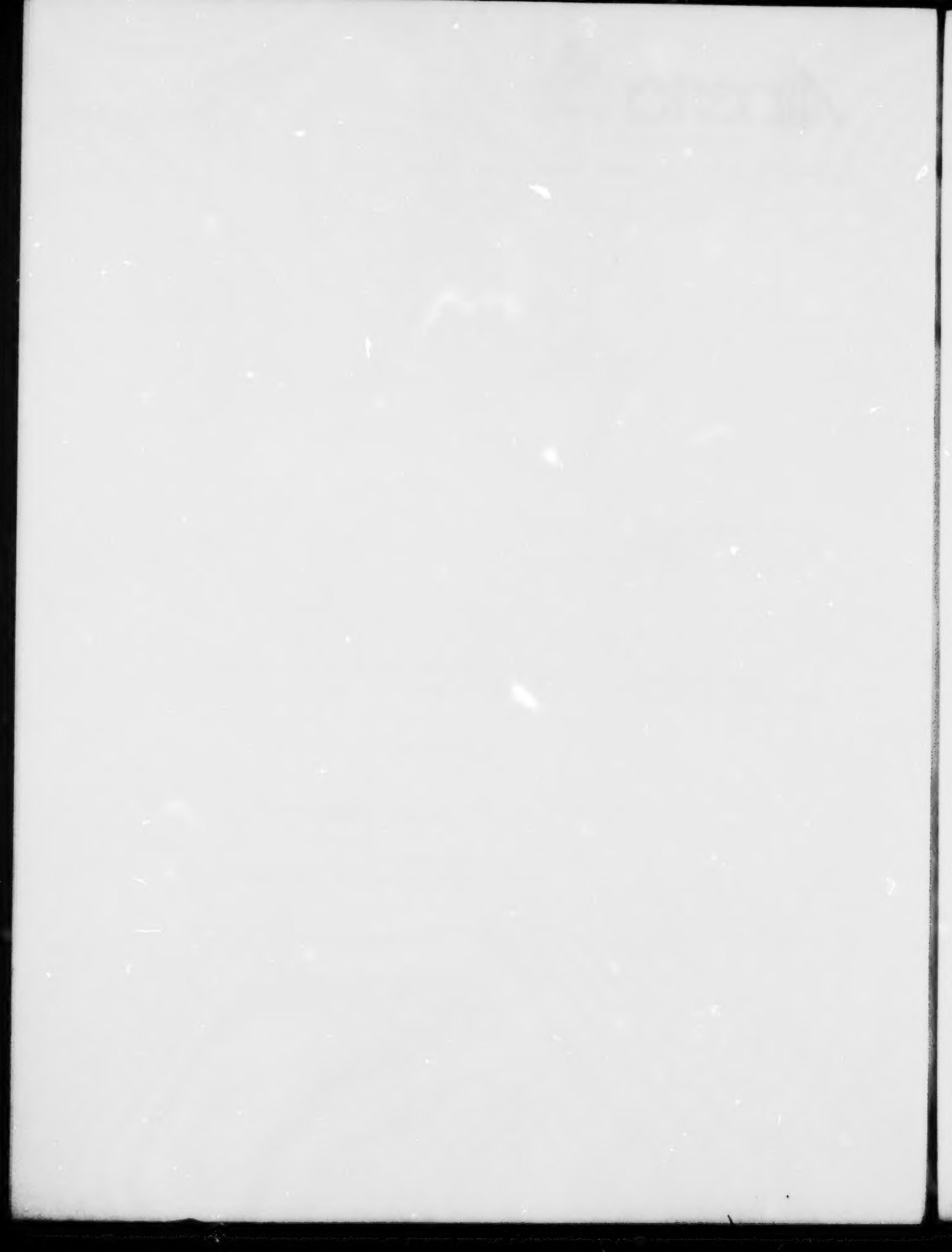
Sir:

I have the honour to hereby transmit the Annual Report of the
Department of the Environment for the fiscal year 1986-87.

Respectfully submitted,

A handwritten signature in cursive script, reading "Ken Kowalski".

Ken Kowalski
Minister of the Environment



The Honourable Ken Kowalski
Minister of Environment

Sir:

I have the honour to present the seventeenth Annual Report of Alberta Environment, which covers the fiscal year ending March 31, 1987.

Respectfully submitted,

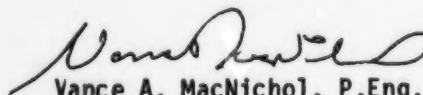
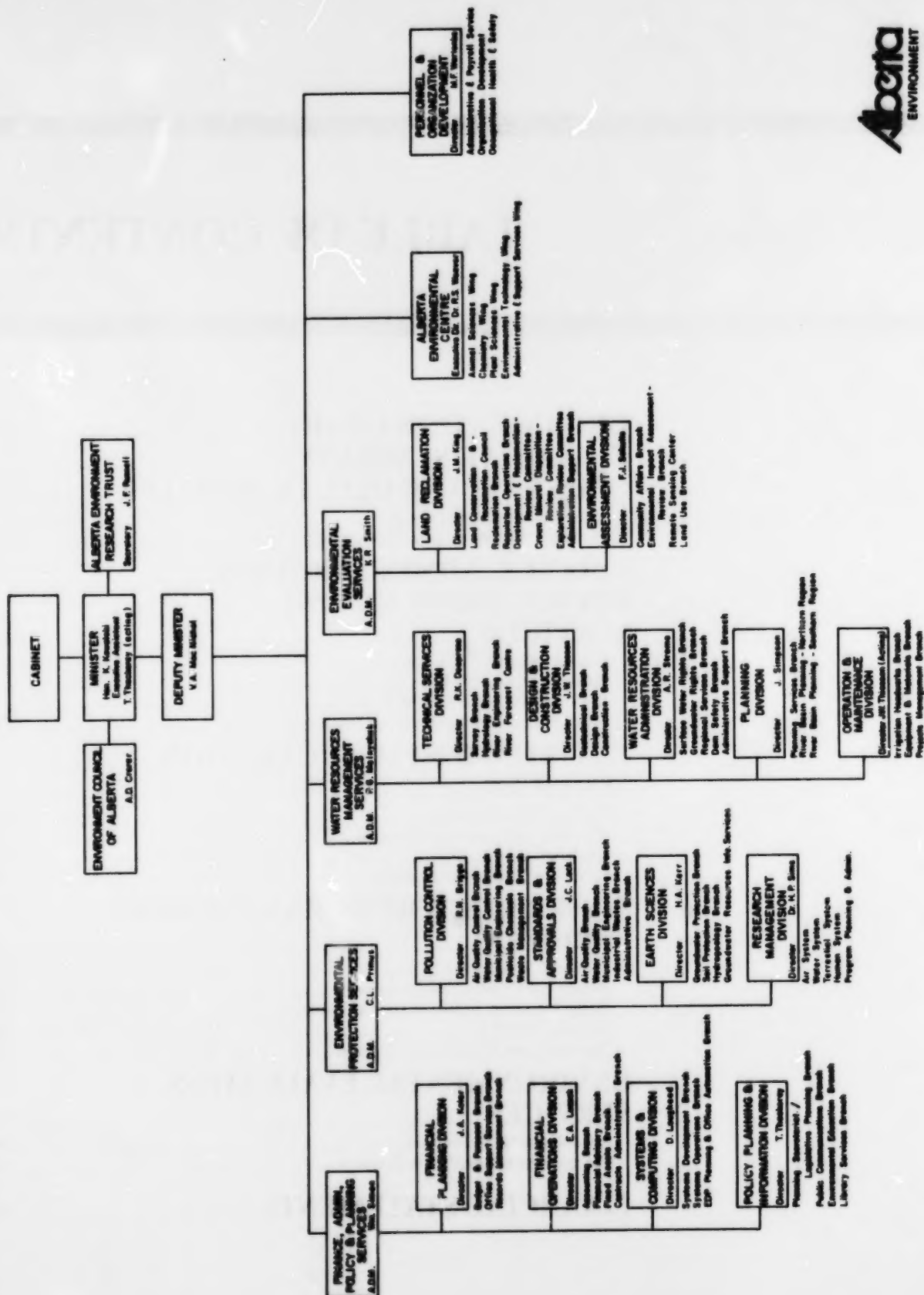

Vance A. MacNichol, P.Eng.
Deputy Minister



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EXECUTIVE SUMMARY

Since its inception in 1971, Alberta Environment has been one of the forerunners in environmental management. As such, several key initiatives were undertaken and accomplished in 1986-87. The latter part of the year marked the beginning of new challenges for the department as it embarked in a new direction with a changed mission statement. This new mandate is best reflected in the March, 1987, Speech from the Throne where the Alberta Government stated its commitment "to achieve the protection, improvement and wise use of our environment now and in the future."

With a significant transition in its mandate, several key initiatives were instigated by the department. For 1986-87, Alberta Environment's main objectives were to improve the overall efficiency and effectiveness of the department and to increase public communication and education.

The department made considerable strides towards these objectives, one of the most significant initiatives being the appointment of a review panel to undertake a comprehensive look at environmental law enforcement in Alberta.

To effectively proceed in the department's new direction, public communication, education and support was an integral part of ensuring the success of the department's objectives. The department continued to place priority on public communication and participation with its considerable investment in public education. Over the past year, six educational programs which explore environmental issues were developed and co-produced by the department.

Concurrently, several services experienced significant activity by providing information to client agencies and to the public. The Alberta Environmental Centre published numerous journal articles, technical reports, and extension material throughout the year. A second edition of "Biological Pest Management for Interior Plantscapes" was produced, following world-wide distribution of 4,000 copies of the initial print.

The Ground Water Information Service in the Hydrology Branch showed a six per cent increase in inquiries over the previous year. Private, industrial, consult-

ing and public sectors utilized the service as a primary source of data collecting for groundwater information in Alberta.

Overall, the Communications Branch distributed 177 news releases and filled 2,041 requests for department publications.

During 1986-87, Alberta Environment remained committed to addressing water resources management concerns across the province. The department reaffirmed its commitment in meeting the challenging and diversified present and future water needs in the province through: conservation and efficient use of existing water supplies with the rehabilitation of the irrigation headworks and canal systems, augmented by an on-stream storage reservoir on the Oldman River. The Oldman River Dam project proceeded on schedule and on budget with the construction of a site access road, installation of a work camp, the awarding of contracts for the design and fabrication of spillway gates, control valves and stoplogs. Tunnel diversion excavation was also started.

In the Land Reclamation area, the department experienced increased activity as Reclamation officers monitored the construction and operation of 277 major surface disturbances. Reclamation officers also issued 78 reclamation orders and 1,405 reclamation certificates on abandoned surface disturbances.

The department is also responsible for the actual reclamation of derelict lands and administration of the Land Reclamation Program, funded by the Alberta Heritage Savings Trust Fund. During the 1986-87 fiscal year, funding was provided to reclaim 123 derelict sites; of those, 114 projects were on municipal lands and nine were on crown land.

In the area of recycling, the Resource Recovery Grant Program continued to gain momentum as the department provided 15 resource recovery grants ranging from \$1,400 to \$20,000 to communities and organizations funding recycling projects throughout the province.

Grants were also awarded to 35 municipalities which participated in the 1986 Biting Fly Control Financial Assistance Program.

OFFICE OF THE DEPUTY MINISTER

Vance A. MacNichol
Deputy Minister

Sherman Weaver, Ph.D.
Director
Alberta Environmental Centre

Morgan Wartenbe
Director
Personnel and Organization Development

ALBERTA ENVIRONMENTAL CENTRE

The Alberta Environmental Centre in Vegreville is the province's major facility for environmental applied research, technology development and related services. This past year, the list of provincial departments and agencies served by the centre grew to 15 and, for the first time ever, the centre worked on a suggestion by private industry in the form of a project supported by Syncrude Canada Ltd. These activities were carried out at the request of provincial agencies and the public after review and approval by the centre's Board of Directors and Technical Advisory Committee.

The Departments of Environment; Agriculture; Forestry, Lands and Wildlife; Community and Occupational Health; and the Alberta Research Council continued to be the centre's main clients. Alberta Technology, Research and Telecommunications took an active interest in finding commercial applications for new technology being developed at the centre. Five inventions/processes have been patented and four other possibly exploitable patents are being investigated.

While most of the research was conducted at the centre's 19,000-square-metre main laboratory building in Vegreville, staff also travelled throughout the province to pursue the information requested by client agencies. Studies ranged from using insects for controlling weeds to analysis of environmental pollutants and drinking water treatment, and the studies involved specialists from fields as diverse as veterinary medicine, botany, chemistry, microbiology, engineering and library science. Emphasis continued on attempts to develop a true interdisciplinary approach to individual scientific problems.

Demand for the analytical and diagnostic services available through the centre was heavy. More than 25,000 samples of water, air, soil and other materials were subjected to more than 400,000 tests to support provincial programs in health, pollution abatement and control, and fish and wildlife management. In addition, a further 2,500 to 3,000 specimens of weeds, insects, plant diseases and chemically damaged plants were examined at the request of farmers, gardeners and agricultural personnel. The centre also handled identification of bacteria for nonmedical purposes and provided a rapid toxicity testing service using bacteria.

Providing information to client agencies and the public continued to be a significant part of the centre's work. After the worldwide distribution of the first printing of *"Biological Pest Management for Interior Landscapes,"* a second edition was published to meet the demand. New editions of *"Recognizing Herbicide Injury and Action"* and a manual for the laboratory analysis of air were also produced.

The applied research carried out by the centre can be broken down into six broad categories: pest management, water/wastewater, toxicology, living natural resources, waste management and land resources. Support to clients was also provided in the areas of analytical, diagnostic, extension and technical services. All of the work was being done to provide practical answers to real problems faced by client departments and concerned Albertans.

Analytical, Diagnostic, Extension and Technical Services

The greatest single activity performed by the centre is providing information on the quality of air and water, and on the results of studies on wastewater, weed science and crop protection, to the people of Alberta and other government departments and agencies. Services in this area range from providing routine chemical analysis of drinking water samples to agricultural pest identification services.

The centre is the main chemical analysis laboratory providing support to Alberta Environment's licensing, monitoring and enforcement programs. As part of a major air analysis services program, approximately 7,800 air samples were run through more than 22,600 tests. They were analyzed for sulphur gases, lead and other metals, nitrogen oxides, vinyl chloride and other substances. Centre staff also worked to develop new and more effective tests for atmospheric pollutants.

The department was also supplied with information used in monitoring municipal water supplies, waste treatment facilities, industrial waste discharges and surface water quality. The centre's facilities were used frequently by public health units throughout the province to test the quality of drinking water from wells and other private water supplies. About 17,457 water samples were received

and analyzed under these programs. In addition, water, effluents, soil, sediments and other materials were analyzed for trace levels of other contaminants. A total of 1,115 samples were tested for PCBs (polychlorinated biphenyls), hydrocarbons and other significant pollutants.

Identifying insect pests, weeds and plant diseases was another function of the centre. In 1986-87, 626 insects, 893 plant diseases and 339 weeds were identified. Cases of suspected chemical damage to crops were also submitted for diagnosis.

Approximately 746 samples were examined by the microbiological identification and enumeration section for a total of 12,184 parameters. A service which uses bacteria for rapid toxicity testing examined industrial effluents, sanitary landfills and surface waters and continued development work on this technique.

The tritium and radiocarbon analysis laboratory provided service to seven government agencies. Dryland salinity, wastewater management and archaeological dating were some of the areas where the laboratory supplied information.

Electron microscope studies supported research into aquatic biology, waste management and many other fields. A total of 850 electron microscope investigations were conducted on material ranging from pollen grains to fungi tissue and fly ash.

To confirm the accuracy of analyses performed at the centre, high priority was given to quality assurance and quality control. To that end, a quality control manual for sampling and analysis was prepared. The completion of the centre's quality control laboratory allowed staff to ensure the accuracy of their data.

Other services provided by the centre included the investigation of livestock toxicology, assistance in the capture of big game animals and developing methods for the detection and analysis of a variety of environmentally significant chemicals.

Pest Management Research and Development

Since the centre doubles as an Alberta Agriculture's Regional Crops Laboratory for the northeast and north central areas of the province, finding effective, practical and environmentally sound methods for the control of weeds, plant diseases and insect pests of crops and livestock was the object of research by centre staff. Many of the studies were also aimed at eliminating or reducing the use of chemical pesticides.

The effectiveness of herbicides was determined under different soil moisture conditions in field crops. The eight most commonly used herbicides in Alberta were found to range from highly effective to practically ineffective, depending on soil moisture. This information was made available to Alberta farmers. Evaluating the performance of experimental and registered herbicides for weed control in cereal and canola crops and checking the tolerance of different varieties of wheat, barley and canola to the herbicides were among the projects undertaken at the centre. The use of activated charcoal to neutralize herbicide residues in soil was also examined.

A major research area was determining the economic impact of crop losses due to weeds. Field trials to determine the effects of selected weeds in cereal and canola crops and the costs and benefits of weed control with pesticides were conducted. To help farmers determine whether it is economical to spray their field crops for weeds, researchers developed charts and graphs based on weed densities, the selling price of crops and the cost of herbicides.

Biological weed control focussed on the use of natural enemies such as insects and selected plant diseases to combat weeds. A further study identified toad flax, a potential menace in poorly tilled soils and noncropped areas, as the highest priority weed among potential targets for this kind of program. A defoliating moth released on toad flax near Mannville was observed to have survived and bred in the weed. Further studies investigated potential target weeds for control by insects and monitored the release and survival of the subject insects. Leafy spurge flea beetle species were released in four new sites, while monitoring of the flea beetles and insects which attack perennial sow thistle continued.

Finding ways to prevent plant disease in field crops, ornamental plants and turf was the focus of studies which included evaluating the effectiveness of registered and new disease control chemicals on cereal and canola crops. Plant disease surveys revealed that virulent blackleg disease of canola is continuing to spread in northeast Alberta for the fourth straight year. In co-operation with Alberta Agriculture, centre staff developed a plan to increase farmer awareness of the problem and began experiments to find blackleg-resistant varieties of canola. Investigations continued into the causes and control of "alfalfa decline" and other diseases of alfalfa. Field experiments were carried out on the effects of soil-borne fungi, micro-organisms, snow mold and brown root rot on alfalfa.

Controlling insect pests in livestock and crops was the objective of several applied studies, including numerous field studies on the control and impact of insects in vegetable crops. Research continued on combined chemical and biological control in greenhouse vegetable crops and the effect and control of insect pests in canola. In controlling black flies and other biting fly pests (a particular problem in the Athabasca area) novel on-farm control methods were used. A simple on-farm swine mange test was developed for Alberta hog farmers.

Staff also analyzed pesticide residues in water, soil, vegetation and sediments as a service to clients, including Alberta Environment and public health units throughout the province, as well as in support of centre activities. A total of 1,878 samples were tested for pesticides. Research reports on swine mange, pesticide residues in cattle and control of insects in vegetable crops were completed.

Water/Wastewater Management Research and Development

From water and wastewater treatment to the effects of contaminants on aquatic systems, centre staff looked into a wide range of water-related problems.

The centre's mobile water treatment research plant was used to evaluate drinking water treatment technology.

Particular emphasis was placed on ways to inactivate or remove the organism which causes "beaver fever" or giardiasis, a project carried out in co-operation with the University of Calgary. The results were presented at an international giardia conference held in Calgary and cosponsored by the centre. Work also continued on a long-term project to determine the distribution and concentration of environmentally significant chemicals (such as mercury) in Alberta's waters. To monitor mercury levels in fish, over 700 fish tissues from 31 lakes and rivers were analyzed. In addition, a report on an earlier study on mercury residues in fish from 24 Alberta lakes and rivers was completed and a manuscript on the geochemistry of mercury is being prepared.

Determining the effects of wastewaters on natural water systems and the life they support was the object of a number of aquatic toxicology studies. Reports generated as a result of these studies included those on the chemistry and toxicity of alum sludge, coal mine wastewater and kraft pulp and paper mill effluent. A number of new laboratory techniques were developed to study changes in fish exposed to effluents.

Environmental Toxicology

A high priority was placed on inhalation studies to determine the toxic effects of gases, vapors, particulates and aerosols on living organisms. The effects of hydrogen sulphide was the subject of a major research report in the inhalation toxicology laboratory. The inhalation toxicology facility, the only installation of its kind in western Canada, was commissioned this year. Thirteen studies were completed on the effects of hydrogen sulphide on laboratory rats. Plans were drawn up for studies on the long-term effects of exposure to hydrogen sulphide. A major problem identified during the Lodgepole Blowout Inquiry was solved when scientists at the centre developed a method to measure the amount of sulphide in a mammal's central nervous system.

Studies on the toxic effects of petrochemicals and fossil fuels on livestock and fish were undertaken. Trials on the biochemical effects of crude oil ingestion on laboratory animals collected information on the resulting pathological changes in liver, kidney and other tissues. A study on the uptake of specific petrochemicals by fish was completed, as was a report on the toxicity to fish of naturally occurring bitumen in the Athabasca River.

Living Natural Resources

Research was conducted into a range of environmental changes which may affect the province's living natural resources - fish and wildlife. To improve the productivity of wildlife and their habitats and to provide the knowledge required for intensive big game production were the goals of several studies. Preservation and rehabilitation of the rare peregrine falcon was the objective of one program. Undertaken in the Fort Chipewyan area, it monitored chemical residues in the falcons and their prey. As well, a report was prepared on the residues in the fat and eggs of colonial nesting birds. Further studies on the effect of pesticides on nontarget species, particularly game birds, were conducted. A major project was conducted on the environmental impact of grasshopper control activities.

Determining the effects of forestry operations on bears is the goal of centre researchers who are now analyzing five years of studies in the Berland Timber Management Area. Over 50 grizzly and brown bears were captured and 38 tracked in the wild by means of radio collars to provide data on population, range and habitat factors which affect the animals.

Staff also examined ways of controlling problem wildlife, particularly coyotes and pocket gophers. Use of toxic collars and audio tape-playing devices were tested as means of controlling coyotes. Work on pocket gopher control was aimed at reducing damage to forage crops, using a toxicant glue mixture to control the numbers of animals.

Studies on raising big game continued in co-operation with the Kikino Game Ranch near Lac La Biche, including the completion of a resource inventory of the ranch. Related work included the continued development of a system for monitoring the movement of wild animals.

The design, development and testing of humane traps was the focus of a research project conducted under an agreement with the Fur Institute of Canada. A trap was developed which passed all criteria and tests and appears to have been successful in field trials by trappers.

Waste Management Research and Development

Reducing environmental waste problems while exploiting the economic potential of wastes are the compatible goals of studies at the centre which use physical, chemical and biological processes to provide waste management data.

A pilot-scale incinerator was installed in the new incineration research building. Staff plan to use the facility to examine incineration as a safe method of both using and disposing of wastes. Preliminary testing of wastes was carried out on a modified laboratory scale system for studying waste incineration.

In co-operation with Environment Canada, the U.S. Environmental Protection Agency and private industry, centre staff continued research work on solidifying and stabilizing waste. The objective of the work was to assess the suitability of selected processes for waste management in Alberta. Emphasis was placed on determining the value of commercial stabilization and fixation processes in Alberta's severe climate. Another study focussed on chitosan, a naturally produced polymer which may be used in waste management applications such as flocculation and heavy metal absorption. Chitosan was produced in a pilot-scale fermenter, and its economic potential in Alberta was investigated by the Department of Technology, Research and Telecommunications.

Several studies continued into microbiological processes with application in waste management. Staff continued developing microbial tests for determining the toxicity of environmental samples, and work progressed on the use of bacteria to remove toxic heavy metals from wastes such as sewage sludge.

In co-operation with an exchange scientist from Harbin, China, a study was begun to determine if local waste materials can be used to grow exotic mushrooms on

a commercial scale. Straw, sawdust and aspen wood are some of the potential growth media examined. The program is of special interest to Alberta Agriculture, Special Crops Branch.

Land Resources Management Research and Development

Finding ways to restore lands disturbed by unusual activity (e.g., strip mining) was a major goal of the centre. Studies focussed on developing and testing ways to accelerate reclamation, lower its cost and ensure that the reclaimed land is restored to its original productivity. One program is aimed at selecting, developing, testing and licensing native plant species for use in reclaiming disturbed lands. Initially, work concentrated on species to be used on disturbed lands on the eastern slopes of the Rockies. Species of native grasses were evaluated for their reclamation potential and several useful strains were identified. Other lines have been selected and are being studied for their potential use in rangeland rehabilitation and improvement in eastern slope agricultural areas and southern Alberta. A number of plant species were investigated for their ability to take up large volumes of water – an ability which has particular application in oil sands tailings ponds.

Studies of soils with excess soluble salts led to a program aimed at relating a soil's physical properties to the performance of various plants which, in turn, would allow accurate predictions of how well certain soils can be reclaimed. Two large field experiments using deep rooted plants to change the physical properties of soils were begun in studies aimed at gathering information on the control of dryland salinity.

A reliable method of measuring soil compaction was developed, related directly to how easily plants can send their roots down into the soil under study. This is significant for studies on problems of soil compacting, especially around oil and gas leases, and on how to solve those problems.

Technical Support

This program area encompassed the broad range of technical services required to support the centre's scientific and technological development activities.

This included the management and development of the centre's 300-hectare Vegreville site. Crop research plots were developed and maintained, plot equipment was repaired and designed and the site was upgraded through activities such as fencing elk pastures and seeding hay fields. A large fleet of equipment and vehicles was maintained, including specialized experimental plot machinery.

A centre waste management program continued. It included operation of an interim wastewater treatment plant and systems for managing pesticides and concentrated laboratory wastes. As well, three specialized water treatment systems were operated – a recycling plant supplying water to fish tanks, a reverse osmosis unit and an ion exchange unit which provided water for laboratory use.

Major efforts were directed toward developing centralized computing facilities to collect and process data

generated by centre laboratories. Special emphasis was placed on the customization and enhancement of software for the mainframe computer.

An instrumentation and controls program involved repair and maintenance of instruments as well as design and development of equipment and systems for monitoring and data collection purposes. Thirty-six controlled environment growth chambers and four seed germinators were operated at capacity, providing year-round growing conditions for plant-related studies.

An Animal Care Committee supervised all animal facilities at the centre, following the guidelines of the Canadian Council on Animal Care. Veterinary services were provided to all animal users, as were pathological services involving the analysis of tissues and fluids.

Most capital facilities development projects during the year were suspended in September of 1986 to comply with provincial budget restrictions, including all laboratory and site development. However, greenhouse construction was begun. The provincial Fish and Wildlife Division and Ducks Unlimited were assisted in reclaiming wetlands on the site for water storage and waterfowl production. Installation of equipment in the incineration research building continued.

Administrative Support

Administrative support was provided to centre programs through the Common Services Wing and smaller administration units attached to each of the four other wings. As part of the centre's response to the provincial restraint program, the number of programs at the centre was reduced from 56 to 37. Of the centre's 1986-87 budget of \$11.6 million, \$485,000 was lapsed and returned.

Library, financial, communications, personnel and related functions were performed by the Common Services Wing. The library provided information to staff through reference searches, collection development interlibrary loans and similar services. More than 97 in-depth, on-line computer reference searches and 1,195 manual searches were completed, and over 3,700 incoming interlibrary loans were processed.

Administration and control of the centre's \$11.6 million budget involved operating an accounts section, a central stores facility and a central duplicating facility.

The communications section conducted tours for more than 500 people and produced an annual review and a newsletter. An information display was designed and the first phase was completed. The full-time public affairs position at the centre was cancelled as a part of the government's restraint program.

Personnel services staff were active in training, payroll, classification and other staff relations duties. An active occupational health and safety program was maintained, and an emergency response team was active.

Administrative units attached to the technical wings functioned in a variety of support duties such as providing experimental design and data analysis, distributing chemical analysis reports and planning duties related to construction of facilities such as the incineration research building and the new greenhouse.

PERSONNEL AND ORGANIZATION DEVELOPMENT DIVISION

The Personnel and Organization Development Division is directly responsible to the deputy minister for providing those human resource management services which will enable the department to effectively serve the public with a competent, safety-conscious work force.

The division consists of four branches under the leadership of the director: Administrative and Payroll Services, Personnel Services, Organization Development and Occupational Health and Safety.

Administrative and Payroll Services Branch

This branch provides the division's administrative services and is also responsible for payroll functions for the department. As of March 31, 1987, the department had 1,174 salaried positions (figure 1), with more than half located in Edmonton and the remainder in field offices throughout the province (figure 2). Major field offices are located in Vegreville, Lethbridge, Calgary, Grande Prairie, Peace River and Red Deer. The distribution of employees within the department is reflected in figure 3.

During 1986-87, 54 salaried and 277 wage employees commenced work with the department, 104 salaried and 318 wage employees terminated their employment and five employees were transferred to other provincial government departments.

Personnel Services

This branch provides comprehensive personnel services through a staff of four personnel administrators and the division director.

Organizational changes and regular updating of position descriptions resulted in the classification of 148 positions. The staff has delegated authority to make classification decisions on all positions except those in management. The branch conducted 67 competitions to locate and hire staff.

The staff of this branch assists employees and management in employee relations issues, career planning, organization development matters, grievances and complaint procedures. They also help with the administration of the Long Term Disability Income program and assist

with the design and delivery of in-house training.

Organization Development Branch

This branch is responsible for responding to initiatives from senior management and for proposing initiatives to senior management which will improve department performance in achieving its goals and objectives.

During the year, senior management commissioned two significant studies – one to develop a communications plan and the other to develop a directional plan for the department. Personnel and Organization Development Division staff served on the human resource planning sub-committee of the directional planning study.

The branch continued to administer the staff development function for the department. Involvement in external courses was somewhat curtailed by budget constraints. Internal programs continued, the main one being "Supervision" with offerings in Edmonton, Vegreville and Lethbridge. On the last program offered in Edmonton, the principle of making participants responsible for their own learning was introduced. Twelve line managers were trained to deliver the "Working" program, which is similar to "Supervision" but is intended for front-line staff. A variety of other general and specialized programs were delivered on the basis of need.

The department *Personnel Policies and Procedures* manual was completed and distributed to senior managers.

The branch head has responsibility for the department appraisal systems and shares responsibility for the "Women's Program" with a female line manager selected by the deputy minister. Assistance to the director and other personnel administrators in such areas as employee relations issues is provided on request.

Occupational Health and Safety Branch

This branch co-ordinates the department's occupational health, safety and hygiene programs, provides a professional consultation service to staff and is the main contact with Worker's Health Safety and Compensation and the Occupational Health and Safety Branch of the Personnel Administration Office.

Emphasis remained on safety training and awareness programs, with special attention given to temporary staff. During the year, 72 in-house safety training programs were arranged, including four courses aimed at assisting the department in meeting the requirements of the new "Transportation of Dangerous Goods" legislation.

A biennial review of Occupational Health and Safety program activities was conducted. This consisted of environmental monitoring at all high-risk work sites to ensure

that good industrial hygiene practices are in place to control harmful work place contaminants and of an internal evaluation, including questionnaires and interviews to ensure that management and staff are satisfying all requirements of the legislation and government program.

New initiatives in the area of occupational health included a departmental health policy and establishment of periodic and pre-employment medicals for selected positions.

FIGURE 1
POSITIONS BY CATEGORY

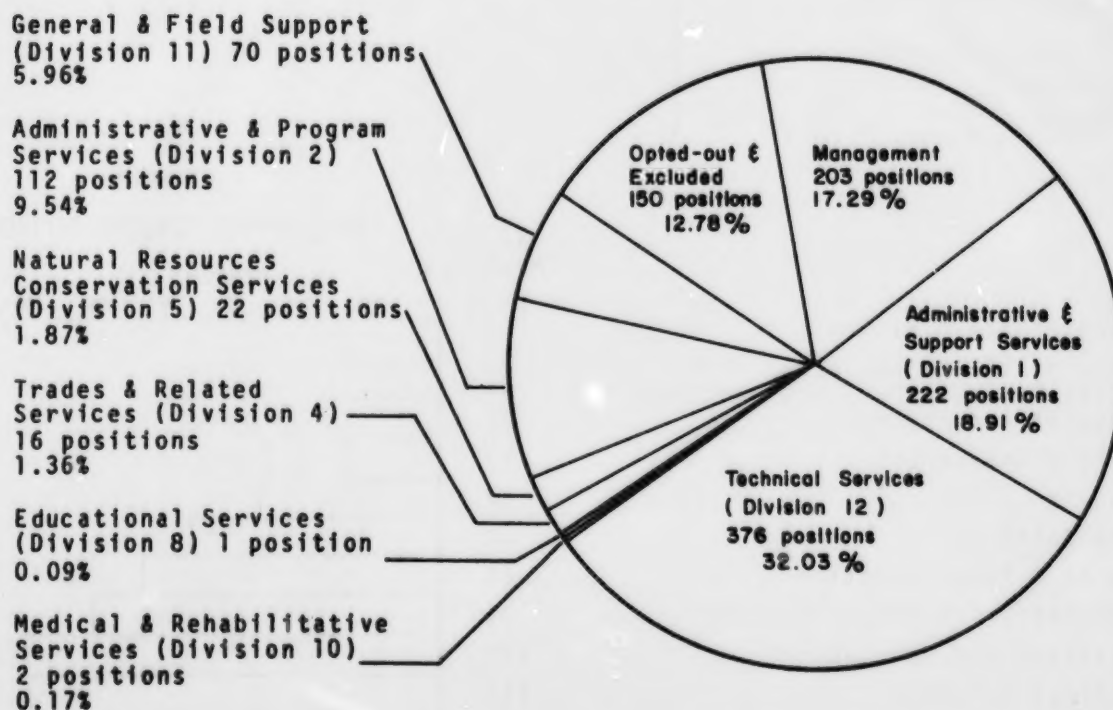


FIGURE 2

EMPLOYEE LOCATIONS

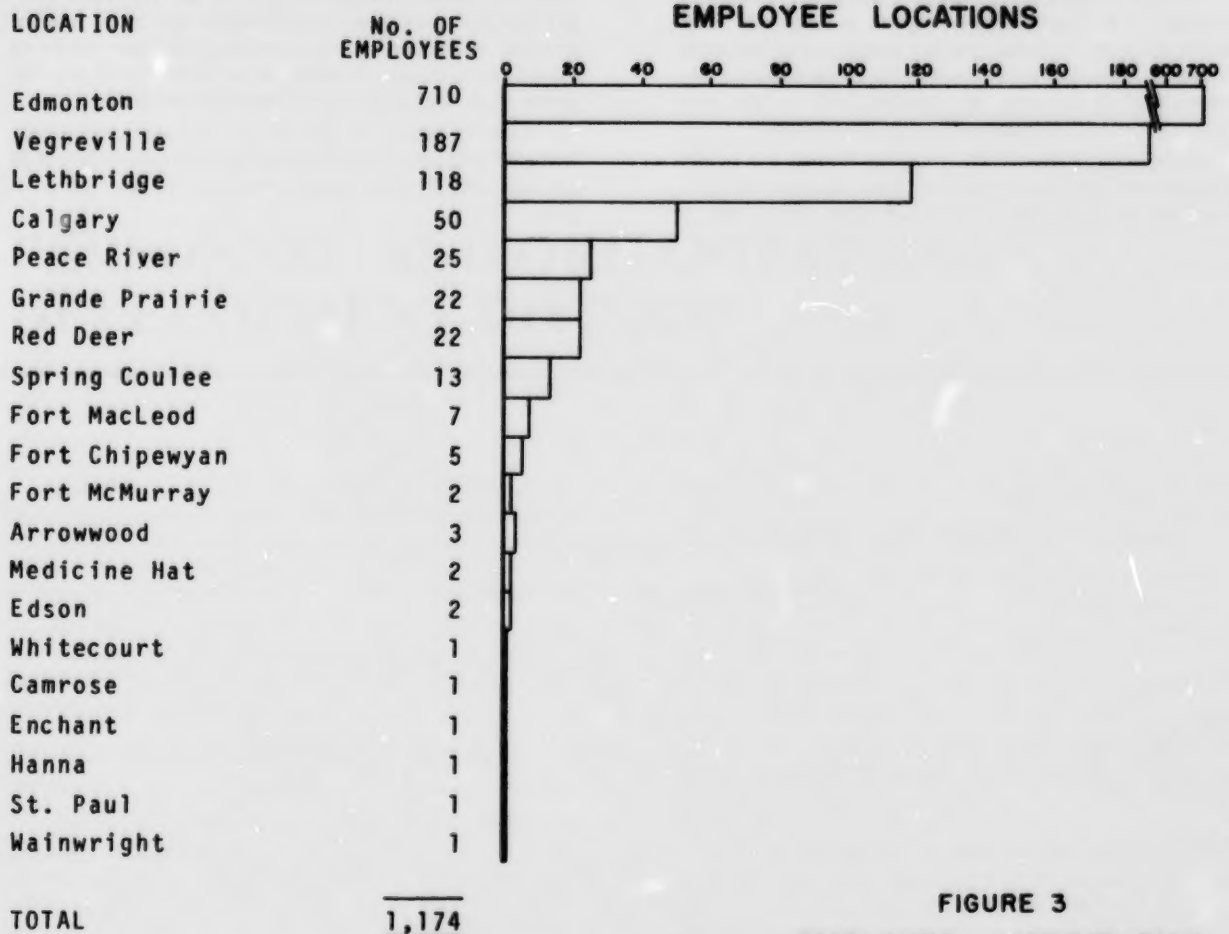
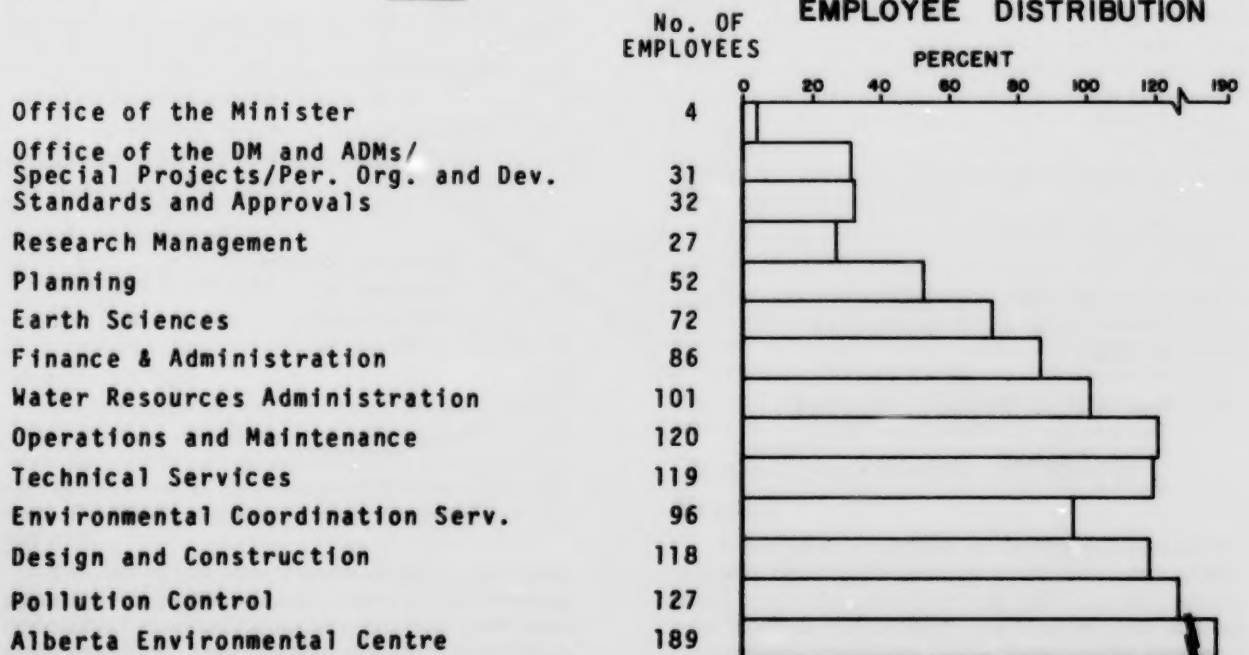


FIGURE 3

EMPLOYEE DISTRIBUTION



FINANCE, ADMINISTRATION, POLICY AND PLANNING SERVICES

William Simon, CMA
Assistant Deputy Minister

J.A. Kolar
Director
Financial Planning Division

E.A. Luczak
Director
Financial Operations Division

Dave Lougheed
Director
Systems and Computing Division

Tom Thackeray
Director
Policy Planning & Information Division

Finance and Administration Services provide administrative and support services to the department in areas of financial planning, financial operations, systems and computing, policy planning and information services.

The Assistant Deputy Minister of Finance and Administration Services is a member of the executive committee and is the senior financial officer of the department and is responsible for administering the Financial Administration Act. This involves establishing a system of efficient internal control, developing a code of accounts to satisfy both central agency and departmental requirements, satisfying financial reporting needs of departmental personnel and advising expenditure officers on monitoring and control of expenditures.

FINANCIAL PLANNING DIVISION

The Financial Planning Division co-ordinates the budgetary process, records management, mail, courier, furniture, maintenance and duplicating services.

Budget and Forecast Branch

The branch compiled the 1987-88 Alberta Heritage Savings and Trust Fund departmental budget of \$47,350,000, the 1987-88 General Revenue budget of \$87,533,820 and the Capital Fund Budget for Construction of Water Development Projects of \$36,800,000. The branch also co-ordinates the Public Works, Supply and Services budget submission for capital construction and accommodation.

The branch monitored the 1986-87 departmental general revenue and Alberta Heritage Savings and Trust Fund expenditures and co-ordinated several government employment programs, as well as managing departmental space needs and insurance matters.

Office Support Services Branch

Among the services provided by this branch are central duplicating, courier and mail systems, building maintenance and security, telecommunications and furniture, photocopying, microfilming, diazo and other related areas.

Services are provided through a central office in Edmonton and regional offices in Lethbridge, Red Deer, Grande Prairie, Peace River and Calgary.

During the 1986-87 fiscal year, central duplicating operations produced 4,343,846 copies and 27,209.5 square metres (89,315 prints) of diazo printing and bound 21,527 books and reports. As well, the branch mailroom processed 4,478 bags and 1,346 boxes of external mail and approximately 2,500 bags of internal mail. The courier handled 1,156 special pickups and deliveries, in addition to the regular routes.

Records Management Branch

The branch co-ordinates and develops the records management program as legislated under the Public Works, Supply and Services Act.

Ongoing activities have included the maintenance of the administrative file system and of the records disposi-

tion program. Cost savings of \$292,967 were effected by the latter, through the transfer and/or destruction of 56 cubic metres of records.

Developmental activities have included assisting areas in microfilming and file system design projects and in redesigning a financial form. Training was also offered to 20 individuals.

FINANCIAL OPERATIONS DIVISION

The Financial Operations Division's major function is to provide centralized financial services to the department, which includes the development and implementation of internal and external accounting policies, procedures and financial systems required to ensure compliance with mandatory, government-wide and departmental financial and administrative control systems. Division staff act as advisors, providing support to the department in the areas of expenditure and revenue accounting, fixed asset control, financial systems development, financial consulting and internal systems review services.

The division is comprised of four branches: Accounting, Financial Advisory, Fixed Assets and Contracts Administration.

Accounting Branch

The branch develops, implements and maintains departmental accounting and financial reporting systems to ensure operational procedures are in accordance with the Financial Administration Act and other related government policies and procedures. Responsibilities include payment of all vendor accounts; recording and reporting of department liabilities, revenues and expenses; and collection of outstanding accounts receivable. In addition to maintaining the normal activities during 1986-87, branch staff had varying degrees of involvement in planning and preparing for conversion of the department to the new central/departmental financial system (CFS/DFS), with implementation on October 1, 1986. Additional time was spent on employee training, code conversion and DFS briefing sessions.

Financial Advisory Branch

The branch provides advisory services to other divisions for the improvement of financial and administrative systems. The branch also conducts internal financial reviews and liaises with the Office of the Auditor General and Alberta Treasury to ensure that sound internal financial control procedures are in place in the various divisions and that these procedures meet the requirements of the Financial Administration Act.

Fixed Assets Branch

The branch maintains an automated system to safeguard the department's fixed assets and ensure that they are used efficiently. A program of cyclical physical verification of departmental assets is in progress. The branch is also responsible for the maintenance and preparation of financial records and statements pertaining to the Surface Reclamation Trust Fund.

Contracts Administration Branch

The branch is responsible for developing, implementing and administering policies and procedures relative to the preparation and approval of contracts and agreements. Consultative services are provided to departmental staff regarding negotiation, development and preparation of contracts and agreements, ensuring intentions of the department are properly set forth and that legal and financial requirements comply with established government guidelines and legislation.

SYSTEMS AND COMPUTING DIVISION

The Systems and Computing Division supports all departmental programs in the planning, development, operation and maintenance of computer programs and systems. The division also provides computing facilities and trains departmental staff to use computer equipment and programs.

Systems Development Branch

The branch is responsible for managing projects involving the development and enhancement of large- and medium-scale computer systems. The branch is involved in developing detailed system requirements, for designing the system, as well as programming and implementation. The branch also provides technical support and advice on telecommunications, data base and electronics.

Systems Operations Branch

The branch is responsible for keeping operational systems up-to-date and operating reliably and efficiently. The branch also develops small-scale systems, enhances and maintains all general-use equipment and provides a consulting service to staff on operational problems.

Current Systems: Over 20 data systems and 40 scientific computer programs are maintained. The systems contain air quality, water quality, hydrometric, climatological and groundwater data used in the department's monitoring, assessment and regulatory activities. A minicomputer regularly collects data on water levels, precipitation and water quality.

Technical/engineering computer programs simulate various hydraulic, hydrometric and atmospheric phenomena, and these programs are used to delineate river floodplains, forecast river flows and predict pollutant concentrations.

Computer programs for statistical analyses, graphs and tabulating data are maintained to allow technical staff to analyze data and assemble reports. Word-processing and spread-sheet programs are widely used to prepare administrative information and technical reports. Many administrative systems are also operated by the department, including a contract registry and a groundwater well and water resource administration system.

Projects Completed: The department's capital project cost monitoring system was completed and will assist in monitoring major capital projects.

The department also converted over to a new financial system as part of an overall government conversion plan. The automation of some instruments in the Lethbridge laboratory was completed. An automated design and survey support system was acquired to enable engineers to more effectively handle design and survey data. Further work stations were installed to improve word-processing capabilities and to assist in report, document and license preparation and administrative tasks.

To simplify and speed up plotting and mapping tasks, further plotting equipment was acquired. Numerous other enhancements were made to departmental systems and common computer facilities to improve efficiency, reduce operating and maintenance costs and enhance the department's capabilities to process and store data.

Co-ordination and Planning: The department and Environment Canada continued exchanging data and systems technology. These exchanges involved water quality, air-monitoring and hydrometric data. The department has access to Canada Land Inventory data, indices of available satellite and air photo imagery, data about municipal water and wastewater treatment facilities and information about special wastes.

EDP Planning and Office Automation Branch

The branch develops computer systems and departmental electronic data-processing plans. The branch also conducts feasibility studies concerning computer systems and develops and implements word processing, electronic mail and electronic filing systems.

POLICY PLANNING AND INFORMATION DIVISION

The Policy Planning and Information Division includes Planning Secretariat, Legislative Planning, Communications, Environmental Education and Library Services branches.

Planning Secretariat/Legislative Planning Branch

In keeping with government restraint initiatives, these branches shared staff. Numerous projects were completed in support of department-wide objectives ranging from facilitating a new departmental financial system (DFS) implementation to reviewing legislative formats.

Public Communications Branch

The branch co-ordinates media relations and the development, design and distribution of a range of public communications vehicles on behalf of the department.

Four issues of the magazine *Environment Views* were published, examining the following environmental themes: drought, the environmental challenge, wilderness experience and careers in environment. Total circulation of this free subscription magazine is approximately 13,500.

A number of activities were organized to mark Environment Week, including displays at shopping malls, an open house at the Alberta Environmental Centre, media interviews and speaking engagements.

Environmental issues again attracted a great deal of media attention and more than 177 news releases were issued. Responses were also provided to more than 2,000 media calls.

The communications director, two public affairs officers and a production assistant in the Edmonton office handled over 260 orders for print materials, photography, advertising, displays, signage and audio-visual presentations. Approximately 2,041 requests for department publications were filled.

Environmental Education Branch

The branch continued to develop educational materials and provide educational services to the public through schools, post-secondary educational institutions, youth groups and community organizations.

Programs in development or production in 1986-87 include:

Water Literacy Program: Phase 2 of the program saw six educational units for schools developed and piloted by teachers in Alberta. Two further units were under development and will be piloted in 1987-88. All units will be ready for production in 1987-88.

ACCESS Water Program: The first year of a two-year development of a one-hour video on Alberta's water was completed. The project is funded by Alberta Environment and will be prepared by the ACCESS network. The program will be ready for airing on ACCESS in 1988.

You Can SNOOP: An early childhood activity booklet was developed and over 15,000 copies were distributed throughout Alberta to teachers and parents. A follow-up unit, *SNOOP on Water*, is currently in development and will be available for distribution in September-October 1987.

Solid Waste Environmental Education Program: Three units on these programs are currently available: *NIMBY* (A Sanitary Landfill Simulation) for ages 14 to adult; *A Matter of Waste*, for grades 5 and 6; and *The Garbage Gazette*, for grades 3 and 4.

Focus on ... Series: Four units in this series were developed and distributed in 1986-87 (Environment, Pollution, Water Quality and Acidic Deposition). Four other titles are ready for printing, and several other titles are in preparation. The series will assist those reading at a Grade 6-7 level to better understand the themes presented. Twenty-five titles are planned.

Environmental Fact Series: This helpful booklet for teachers and students undertaking environmental research is currently being updated for the third edition.

In addition to these programs, the branch has provided workshops across the province (35) to teachers and youth leaders and has presented sessions to students at several colleges and universities.

Assistance has been provided to the following major educational groups: Environmental and Outdoor Education Council, ATA; Science Council, ATA; Alberta Environmental Education Network; Friends of Environmental

Education; Recreation, Parks and Wildlife Foundation; Environmental Education Advisory Committee, ECA; Environment Week Association; and Science Fairs Association.

Library Services Branch

The branch provides information resources in support of departmental research, program and policy-making needs. Private industry, other government agencies, environmental interest groups, members of the public and students of post-secondary educational institutions also make use of its resources. Services provided include: the purchasing of all books, documents and periodicals for the department; the organization of these materials for maximum retrievability and accessibility; and the dissemination of these information resources through current awareness, reference, computerized information retrieval and interlibrary loan activities.

Compared to the previous fiscal year, the staff of Library Services were challenged in 1986-87 by a 22 per cent increase in the demand for reference services and a 13 per cent increase in interlibrary loan transactions. The circulation of books, microforms, maps and periodicals increased by 10 per cent during the fiscal year. Library staff also entered the final stages of planning for the implementation of the automated circulation system. The public relations program started in the previous year continued to be a successful library project in 1986-87. More than 300 departmental staff members attended library orientation sessions explaining the library's services and resources.

ENVIRONMENTAL PROTECTION SERVICES

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Research Management Division

Murray Ellis, P.Eng., M.B.A.
Program Planning

The role of the service is to prevent or control pollution and to encourage research into applied solutions for environmental problems.

A major part of the program involves the setting of standards which govern the maximum amount of contamination permitted to enter the environment from most man-made sources.

Another key part of the program is the monitoring of the environment – principally the air, water, wastes and pesticides – to ensure the standards are being followed and, where necessary, to enforce compliance with the standards.

Research activities focus on finding solutions which are directly applicable to a wide range of environmental problems, including those related to human interactions as well as to man's impact on the natural biological and physical systems.

The service administers grants to assist local authorities in developing regional waste management facilities and nonprofit organizations in establishing recycling centres.

POLLUTION CONTROL DIVISION

The Pollution Control Division enforces the Clean Water Act, the Clean Air Act, the Agricultural Chemicals Act, the Hazardous Chemicals Act, the Litter Act, the Beverage Container Act and regulations.

Air Quality Control Branch

The purpose of the branch is to achieve air quality within established standards.

The branch enforces the regulations under the Clean Air Act and the terms and conditions of clean air licences, carries out general air monitoring, maintains an extensive air quality monitoring network and samples emissions from stationary sources. Industry is required to monitor its operations, and the branch reviews and verifies the results.

During the reporting period, three air quality Directives and four Emission Control Orders were issued. One company was prosecuted for contravention of the Clean Air Act.

The complaints investigated by the branch are listed in table 1. The number of complaints received by the branch in 1986 increased 46 per cent from 1985 totals.

Industry Compliance Review: The branch received monthly and annual reports from major industries such as fertilizer, petroleum, gas processing, pulp and paper, meat packing, thermal power, steel, rendering, chemicals, plastics, cement and wood products. These reports were checked for compliance with licence requirements, and the branch investigated cases of noncompliance.

Table 2: Reports Reviewed Per Year as Required by Clean Air Licences

	1982	1983	1984	1985	1986
* 3,315	3,525	3,538	3,561	3,487	
** 213	207	220	249	268	

* Monthly reports required by licence.

** Annual reports required by licence.

Air Pollution Source Monitoring: In 1986, 264 sampling tests were conducted on 67 stacks at 25 plants to assess the air contaminant emission rates from stationary sources and to check compliance with approved limits. A gas chromatograph for on-site source sampling was used to measure vinyl chloride monomer and total reduced sulphur compounds.

Source emission surveys conducted by industries were reviewed for compliance and the acceptability of sampling technique. Branch staff witnessed some 51 source emission surveys done by industry or consultants.

Urban Air Quality Monitoring: The air monitoring network for Edmonton and Calgary consists of 67 total sulphation stations, 75 dustfall stations, three fluoride stations, six soiling index analyzers, six high-volume samplers and nine comprehensive continuous air monitoring stations. Each of the continuous stations had instrumentation to detect carbon monoxide, ozone, oxides of nitrogen, nitrogen dioxide, sulphur dioxide and total hydrocarbons.

Table 1: Complaints Investigated by Air Quality Control Branch

Type of complaint	Urban Area		Rural Area		Total
	Edmonton	Calgary	North	South	
Odor	96	209	133	142	580
Dust	46	39	66	17	168
Smoke	60	32	78	43	213
Noise	8	3	12	1	24
Miscellaneous	13	10	20	7	50
Total	223	293	309	210	1,035

Four of these stations were based in Edmonton, four were in Calgary and one was used for monitoring the other major urban areas. An air quality index (IQUA) based on levels of the most significant air pollutants (nitrogen dioxide, carbon monoxide, ozone, sulphur dioxide and smoke) in Edmonton and Calgary was released daily to the media and public.

The monitoring network for smaller urban centres consists of one high-volume sampler, 32 total sulphation, 22 hydrogen sulphide, 45 total dustfall and two fluoride exposure cylinder stations. A comprehensive survey was carried out in Fort Saskatchewan.

Rural Industrial Air Quality Monitoring: The branch operated four mobile laboratories in the Red Deer, Whitecourt, Calgary and Edmonton areas. The laboratories continuously monitor sulphur dioxide and hydrogen sulphide. Special air quality monitoring surveys were conducted in the Elk Point-Cold Lake, Fort McKay and Fort McMurray areas.

A network of 146 hydrogen sulphide, 151 total sulphation and four fluoride exposure cylinder stations were maintained near rural industrial operations.

Monthly precipitation stations were collected and analyzed at ten locations, Suffield, Calgary, Red Deer, Edmonton, Whitecourt, Beaverlodge, Cold Lake, Kananaskis, High Level and Fort McMurray, as part of an assessment of acid deposition in Alberta.

Meteorology and Chemistry: The data set from the operation of the Edmonton air pollution meteorological station (rural) was summarized to show means and standard deviation of variables as a function of time of day and season. A number of derived parameters were also calculated. A paper on rural ozone concentrations was published.

An existing model was upgraded with automatic searching routines and an empirical chemical conversion formula to calculate the maximum downwind concentration of nitrogen dioxide resulting from the operation of a natural gas compressor installation. Most of the air quality impact models were converted from mainframe to personal computer. Three papers on modelling were produced for technical meetings and publications.

The branch participated in the data quality assurance of the Acid Deposition Research Program (ADRP). Station performance audits were conducted for the three ADRP air monitoring stations twice in the year.

A total of 23 complaint-related air samples were collected by adsorption tubes for organic analysis at the Alberta Environmental Centre (Vegreville).

Water Quality Control Branch

The objective of the branch is to preserve good water quality in lakes, rivers and streams through monitoring and enforcement. Major functions during 1986-87 were monitoring industrial plant wastewaters to ensure compliance with standards, investigating complaints and accidental spills affecting surface and groundwater quality and monitoring lakes, rivers and streams for water quality.

Industries: All industries licenced to discharge plant

process wastewater were inspected, and samples were collected for comparison with company-generated data. These data and monthly and annual reports from each plant were used to determine compliance with licence standards. Branch enforcement activity was directly related to licence compliance.

During industrial inspections, wastewater treatment facilities were evaluated to determine their efficiency and whether wastewater quality could be improved.

Information from inspections and monitoring programs was also integrated into the licence renewal process in terms of adequacy of standards and other licence conditions.

Two Water Quality Control Orders and one directive were issued in 1986-87. The orders were issued to Esso Chemical Canada Ltd. and Sherritt Gordon Mines Ltd. in connection with cooling water spills at their respective fertilizer plants near Edmonton in September, 1986. The directive was issued in December, 1986, to TransAlta with respect to a lubricating oil spill at the Wabamun power plant.

Spills and Complaints: In 1986, 148 spills were reported and investigated. These spills involved the accidental discharge of materials with the potential for surface and/or groundwater contamination.

Also, 262 complaints were received in 1986. Many were related to discharge of wastes, contamination from agricultural wastes, surface water contamination and groundwater problems.

Lakes, rivers and streams: Long-term monitoring programs on specific lakes and rivers were continued during 1986. Both chemical and biological data were collected in order to provide an understanding of long-term changes in surface water conditions in Alberta.

A program to assess the water quality and trophic states of 20 lakes associated with provincial parks was continued in 1986. Monitoring also continued in conjunction with the nutrient enrichment project started in 1985 in Elbow Lake.

A one-year water quality study of the Milk River was undertaken in 1986. This work was done in conjunction with Planning Division to assess water quality conditions for a proposed dam on the Milk River. Limited water quality work was also conducted on the Highwood River in conjunction with Planning Division as part of the assessment of instream flow requirements.

A number of significant reports were released in 1986. A series of reports on limnological conditions in the South Saskatchewan River Basin was released. The branch also published a major report on the North Saskatchewan River water quality in the Edmonton area and the Bow River during the 1970s.

Municipal Engineering Branch

The purpose of the branch is to achieve water quality within established standards.

The branch enforces the Clean Water Act and regulations with regard to municipal water and sewage systems. Other responsibilities include monitoring municipal water and sewage systems, investigating complaints, providing technical advice and training and certifying municipal water and sewage operators.

Field Services Section: This section is responsible for monitoring, inspections and enforcement. These activities are undertaken through offices in Edmonton, Grande Prairie, Lethbridge and Red Deer.

Table 3 indicates the general level of activities for the section compared to previous years.

Table 3: Field Services Section Activity Comparison

	1984-85	1985-86	1986-87
Inspections	1,288	1,134	1,064
Problem Investigation	84	53	110
Composite Sampling	58	60	67
Communities Inspected	386	400	413
Semipublic Facilities Inspected	77	93	84

Sampling of municipal sewage effluent and water supplies was maintained at the level of available laboratory capacity. Basic monitoring for treated water, sewage discharges, bacteriological quality, fluoride addition and giardia ("beaver fever") was maintained. In addition, the major rainstorm in July, primarily in the central part of the province, resulted in the diversion of manpower resources to help flood-stricken communities maintain their water supplies and, subsequently, to process financial assistance claims.

Many investigations were carried out as follow-up to problems and complaints: continued monitoring of Field Lake and Lac La Biche sewage effluent; evaluation of sewage lift station ventilation; monitoring for uranium and other radionuclides in the aftermath of the nuclear reactor problems at Chernobyl, USSR; monitoring for trace heavy metals in tap water; continued development of iron sequestering as an alternate or replacement for iron removal; monitoring and assistance as part of the Edmonton drinking water study undertaken by Dr. Hruddy of the University of Alberta; improved general safety practices; application of pilot plant techniques to solve plant operating problems; and development of a video program to make people aware of leaking underground gasoline storage tanks.

A growing activity of the section is to ensure that municipalities achieve compliance with their licences to operate. At year end, 196 facilities were required to submit monthly reports, with approximately 52 per cent of the communities achieving total compliance. By the same token, about 77 per cent of communities complied with bacteriological monitoring requirements and 58 per cent complied with fluoridation requirements. Other administrative activities included preparation of annual summary reports of facility inventory, water and sewage effluent quality and of special surveys of drinking water, bacteriological quality and fluoridation.

Certification, Education and Training Section: The section is responsible for operator training and certification programs.

A total of 13 short courses and seminars and two correspondence courses were given by branch staff. As well, a specialized fluoridation course was presented in four

locations. The object of the program is to provide training to municipal water and wastewater treatment plant operators in order to upgrade their skills.

The total registration for the short courses and seminars was 528 and for the correspondence courses, 45. Participants represented 125 Alberta communities.

A manual for operators of small facilities was completed this year. It will be available to all personnel operating water and wastewater facilities. A manual for operators of medium-sized facilities is in the final stages and will be ready soon.

Branch staff provided input to the Water and Wastewater Technician Program at Westerra Institute of Technology. The program is in its third year and as of January, 1987, had 23 registered students.

Assistance was given to other organizations concerned with operator training, such as the Western Canada Water and Wastewater Association.

Alberta is still the only province in Canada that has a mandatory certification program for water and wastewater operators. During the year, there were 12 certification exam sessions for operators. New certificates were issued to 64 operators, and 54 other operators upgraded their certificates by passing certification exams. An additional 259 certificates were renewed for a further two years.

Pesticide Chemicals Branch

The Pesticide Chemicals Branch provides environmental protection through a comprehensive pesticide management program that embraces three broad areas: training, licencing and enforcement under the Agricultural Chemicals Act; the issuing and monitoring of permits for the use of restricted pesticides and the use of pesticides in environmentally sensitive areas; and the administration, co-ordination and supervision of biting fly control programs and the Biting Fly Control Financial Assistance Program.

Training, Licencing and Enforcement: Seminars and training courses were held in Calgary, Edmonton, Fairview, Olds, Red Deer and Whitecourt, with approximately 500 persons in attendance. Lectures were also provided to an additional 500 persons through seminars held by other associations and government agencies. Approximately 240 persons registered in a home study training program for pesticide applicators, and approximately 20 people completed the home study training program for pesticide dispensers.

The branch processed 456 pesticide applicator licence applications (including renewal applications) and maintained files on a total of 1,291 licenced pesticide applicators and approximately 600 licenced pesticide vendors. During the year, 194 letters of compliance were issued with respect to licencing requirements. Restricted pesticide permits were issued as follows: 24 aluminum phosphide permits; 347 cyanide permits; 26 parathion/sulfotep permits; five structural fumigation permits; and 11 strychnine permits.

During the year, the branch received 187 complaints pertaining to the illegal use of pesticides, with 76 of these

complaints requiring investigation. Investigations resulted in 19 letters of compliance, one directive and one prosecution. Inspections were conducted on the premises of licenced pesticide vendors and warehouses (646), along with 397 inspections of licenced pesticide applicators.

Aquatic-terrestrial Surveillance: A total of 258 permits were issued to apply pesticides on, in or near water and for chemical vegetation management in the Green Area. Staff conducted 105 site inspections before, during and after pesticides were applied.

Twelve monitoring programs were conducted to determine herbicide persistence and movement in forest and water habitats. The section participated in the Canadian Forestry Service research project near Grande Prairie to assess the potential of Pronone 10G* as a forestry herbicide.

Assessments were carried out on the effectiveness of physical bottom barriers in suppressing submergent aquatic plants in lakes; selective control of woody plants on a pipeline right-of-way; the options for managing Reed Canarygrass in irrigation systems; and the effectiveness of various manual conifer release techniques.

The section participated in several public meetings on forestry spraying, aquatic weed control and pesticide research.

Biting Fly Program: Grants were awarded to 35 municipalities (total population 1.6 million Albertans) which participated in the 1986 Biting Fly Control Financial Assistance Program. One new program was initiated in 1986. Section staff advised or attended meetings to discuss mosquito control and financial aid with fifteen other communities.

Contracts for \$45,000 were processed by the section. Support was given to studies relating to mosquito biological control methods and toxicity of methoxychlor to fish in relation to black fly treatments. Branch staff carried out 138 routine monitoring and inspection checks of biting fly programs during 1986. Inspections of municipal pesticide storage facilities were also conducted. Several complaints of biting fly problems and pesticide applications were investigated. Information and technical assistance were provided to municipalities and the public through the media, visits and bulletins.

The section trained and provided licence examinations for 29 Class L pesticide applicators and issued 46 permits (required under the Agricultural Chemicals Act) for municipal mosquito control and black fly control programs. Twenty-three different efficacy trials were run on chemicals in use by control programs.

Monitoring for the presence of Western Equine Encephalitis was carried out for six weeks. Results were negative.

Information seminars on BTI and Altosid were held in Edmonton and Calgary. These seminars were attended by industry, government, pesticide applicators and the public.

Displays were provided to the public at four locations, showing biological control of mosquitoes, biting fly biology and control and irrigation problems relating to biting flies.

Branch staff continued to study the control potential

of native predators and parasites in Alberta. The *Chaoborus* and flatworm predators were transplanted to mosquito larval habitats and will be monitored to determine if colonization in these areas is possible. Studies also continued on the biting fly problems caused by irrigation practices in southern Alberta.

Monitoring of chemical treatments for black fly control on the Athabasca River was continued.

Special Program: Six permanent pesticide container collection sites were funded during the year, bringing the provincial total to 94. Almost 696,000 containers were collected, bringing the grand total to 3,107,000 containers collected since the program began in 1980.

Co-operation and Extension Services: The Pesticide Chemicals Branch represented the department on a number of committees including the Safe Food Committee, the Grasshopper Task Force and the Interdepartmental Committee on Pesticides. The branch replied to numerous public inquiries and provided the general public with information through news releases, fact sheets and publications. Pesticide vendors were kept informed through a strychnine alert, and licenced applicators were kept informed through the branch's publication *UPDATE*.

Waste Management Branch

The branch is involved in the management of industrial, municipal and hazardous wastes and resource recovery through recycling and re-use. The branch administers the Hazardous Chemicals Act, the Beverage Container Act and the Litter Act.

Industrial Waste Management: The branch conducted 92 inspection visits to Alberta industries to assess their industrial waste management practices and compliance with their licence-to-operate. The monitoring and enforcement activities ensure environmentally acceptable waste management practices throughout Alberta industry. Studies to characterize baghouse dusts from the foundries in Alberta and the Nisku facility of Alberta Special Waste Management Corporation were continued. A study to determine the management practices regarding perchloroethylene waste associated with the Alberta dry-cleaning industry were conducted.

Municipal Waste Management: The branch gives technical and financial assistance to municipalities to develop and operate environmentally acceptable waste management operations and facilities. During 1986-87, grants were made to the following regional waste management authorities to set up regional waste management systems (including sanitary landfill): Beaver (\$200,000), Big Country (\$225,360), Chief Mountain (\$338,800), Provost (\$412,320), Lac Ste. Anne (\$763,543) and Redcliff (\$284,027).

Through the program, more than 150 open dumps will be, or have already been, closed. Six regional waste management systems started operation. They were: Beaver, Big Country, Chief Mountain, M.D. 52 (Provost), Rocky Mountain House and Lac Ste. Anne.

Hazardous Waste Management: The branch provides information and advice on the safe handling and disposal of hazardous wastes. Some 176 hazardous material spills reports were received, investigated and properly cleaned

up. Similarly, 18 incidents of PCB spillage were received and investigated and the problems were alleviated.

Enforcement: One hundred and ninety samples, of potentially contaminated water, soil and wastes that were enforcement related, were collected. This resulted in enforcement actions initiated against three firms.

Litter Control: The branch enforces the Litter Act and Regulations for the department and also co-operates with all agencies which employ the Litter Act.

Through local enforcement officers, a cleanup order may be issued to an unsightly property. In the event of noncompliance, a directive is issued by the department to have the work done which has been requested. There were nearly 300 orders issued.

Resource Recovery: The branch promotes recycling and re-use of resources by providing information and technology transfer to industry, municipalities and the public. Grants are given to nonprofit groups and municipalities to purchase recycling equipment such as containers for glass or paper and used oil collection tanks.

The branch administers the Beverage Container Act, which established the Alberta container depot system. In 1986-87, 204 licenced depots in Alberta accepted empty soft drink bottles and cans, liquor and wine bottles and juice cans. Glass, metal and plastic containers returned to depots are recycled into other useful products.

Five tanks were installed to collect used lube oil. Three hundred and twelve service stations which take oil back from the public participate in Alberta's "Oil Drop" program. Also, one grant was given out for an oil-skimming project.

There were five projects to collect paper, three for cardboard and one for curbside paper/metal/glass pick up.

Resource recovery grants (15), ranging from \$1,400 to \$20,000, were given to communities and organizations to fund recycling projects.

Grants given out totalled \$118,997 for 1986-87. The total amount of paper recovered for recycling that year was 1,028,026.7 kilograms (2,266,373 pounds). The total amount of oil recovered was 376,798.4 litres (82,885.7 gallons).

STANDARDS AND APPROVALS DIVISION

The Standards and Approvals Division is responsible for the review of all industrial and municipal applications for Permits to Construct and Licences to Operate for new and/or existing facilities in accordance with the Clean Air Act, the Clean Water Act and their corresponding regulations. Permits are issued for new facilities and for alterations to existing operations once the division is satisfied with the proposed environmental protection program. Licences specify operating, monitoring and reporting requirements which must be followed by the operating facility. The division also establishes ambient air, surface water, drinking water and plant decommissioning guidelines and standards and hazardous wastes control requirements. The division prepares amendments to the Clean Air, Clean Water and Hazardous Chemicals Acts and regulations as required.

Air Quality Branch

The prime responsibility and objectives of the Air Quality Branch are to achieve and maintain acceptable ambient air quality through the use of regulations, guidelines and policies applied to industrial and other commercial operations.

A considerable amount of time continued to be spent in assessing possible air quality impact from new industrial developments and on expansion phases of existing facilities in order to ensure that acceptable air pollution control systems were being applied and used. As required under legislation, assessment of existing industrial operations for licencing was also a major part of the total workload for the year.

A total of 108 permits and 455 licences were issued under the Clean Air Act during the year (see table 4).

Staff continued to participate extensively in Energy Resources Conservation Board hearings and inquiries. In addition, the branch was active on several committees dealing with acid rain causing emissions.

Sulphur Recovery Guidelines: The review of the sulphur recovery guidelines embodied in ERCB IL 80-24 was completed in September, 1986, with the issuance of a report by an Alberta Environment and ERCB task force. The review concentrated on the economics of sulphur recovery technology. The task force report was discussed

Table 4: Air Quality Permits and Licences 1986-87

Category	Permits	Licences
Agricultural activities including meat-processing plants	5	38
Asphalt plants	2	11
Chemical plants	6	15
Compressor stations	25	92
Experimental in-situ oil sand operations	7	14
Fertilizer plants	3	2
Gas-processing plants	29	63
Incinerators	15	159
Oil refinery operations	1	3
Power plants	1	3
Others	14	55
Subtotal	108	455
Amendments	13	139
Total	121	594

with industry and representatives of public interest groups. Their recommendations were submitted to Alberta Environment and ERCB for final consideration and decision regarding the changes to the sulphur recovery guidelines. This decision is expected in 1987.

Flaring Committee: The branch headed a Government Industry Consultative Committee on Flaring (GICCOF) with the mandate of reviewing the current flaring technology and its practice in the industry in Alberta. The review has the purpose of identifying any research needs or regulatory changes that will, in the long run, benefit the environment in Alberta. Two studies on current technology and current practice were initiated with funds for Environment Canada and Alberta Environment. Industry representatives provided input and co-ordination for the studies.

SIA Task Force: During the spring and summer of 1986, the branch participated in a task force to review the provisions of the Strathcona Industrial Association (SIA) compliance air-monitoring network in the East Edmonton

industrial area. Several meetings were held between the department and SIA to evaluate the network. In July, 1986, the task force issued a report on its investigations into the restructuring and optimization of the network.

Water Quality Branch

The primary goal and objective of the Water Quality Branch is to prevent, reduce and eliminate industrial pollution of Alberta's surface and groundwaters. Branch staff assess and licence the design, construction and operation of industrial facilities and other operations; initiate and participate in studies and developments which have or could have an effect on water quality in the province; and continue to develop and update provincial water quality standards.

A great deal of staff effort is put into assessing new and existing industrial plants and operations to ensure that they are environmentally acceptable. Last year, a total of 50 permits and 174 licences were issued for the construction and operation of industrial facilities (see table 5); 15 Letters of Permission were granted permitting the nonroutine discharge of liquid effluents; and 16 livestock operations had environmental terms attached to their Certificates of Compliance.

Twelve plants, which were found to have little or no environmental impact, were granted Records of Exemption. Records of Exemption exempt plants from having to file for a licence under the Clean Water Act.

During the past year, branch staff co-ordinated an additional review of groundwater implications resulting from industrial waste water treatment ponds and landfill sites. Staff participated in ERCB hearings and pursued the development of mixing zone, initial dilution zone and predictive water quality effects models for computer application. Other areas of involvement were in river basin planning studies and new industrial process and waste water treatment technology and microbiological assessments of agricultural waste management practices. The branch

Table 5: Clean Water Act Approvals Issued 1986-87

Category	Permits	Licences
Asphalt plants	0	8
Chemical plants	4	11
Coal-processing	3	3
Concrete and cement	0	3
Fertilizer	4	2
Food processors	1	0
Gas plants	15	28
Meat-packing and processing plants	0	2
Petroleum refineries	1	3
Power plants	1	1
Pulp mills	1	0
Sand and gravel washing plants	0	17
Tar sands	6	10
Wood-processing	4	7
Miscellaneous	4	12
Subtotal	44	107
Amendments	6	67
Total	50	174

played an active role in interprovincial and federal-provincial committees and task forces for the development of water quality guidelines and initiated a review of existing industrial performance guidelines.

Municipal Engineering Branch

The major responsibility of the Municipal Engineering Branch is to ensure that municipal water supply systems and sewage works provide a high level of both public health and environmental protection.

The review and approval of all municipal water, sewage and stormwater projects undertaken in the province and the licencing of water and sewage treatment facilities continues to be the main activity of the branch.

A total of 306 permits to construct were issued and a total of 177 licences to operate were issued or renewed for municipal systems (see table 6). In addition, 18 letters of permission authorizing land application of either sewage effluent or sludge and eight letters of permission authorizing special treatment experiments were issued.

Table 6: Municipal Engineering Permits and Licences 1986-87

Category	Permits	Licences
Water supply	123	61
Sewage treatment	61	116
Water and sewer extensions	87	-
Storm sewer systems	35	-
Total	306	177

Another major responsibility of the branch continued to be the development and updating of standards and guidelines and related technical activities.

The branch completed its active involvement in the organization and presentation of a national conference on treatment for organic contaminants in drinking water which was held in Edmonton, April 7 and 8, 1986. The branch also provided funds for an Alberta high school debating team to participate in an international debate on the quantity of drinking water. In addition to these technical activities, the branch continued its participation on the federal-provincial subcommittee that is updating the 1978 Guidelines for Canadian Drinking Water Quality.

The study on Edmonton's drinking water was completed. The branch published new guidelines for the construction and approval of small municipal water and wastewater systems and also released new guidelines for municipal stormwater management. Revisions to the branch's Recommended Standards for Water Supply and Sewerage publication continued to be a major activity and approached completion.

As in past years, branch staff spent a large amount of time assisting municipalities and engineering consultants with the planning, selection and design of water supply systems and sewage works. Input continues to be provided to the Alberta Transportation and Utilities on municipal projects being considered for financial assistance under the Alberta Municipal Grant Program.

Industrial Wastes Branch

The branch is responsible for preparing approvals for facilities where a major part of the operation involves the storage, treatment or disposal of hazardous wastes, assessing the acceptability of proposals for landfilling, land-treating or deepwell injection of industrial wastes, training visible emission readers, developing and implementing a program for the reclamation of decommissioned industrial facilities and has a lead role in the ongoing development of the hazardous waste program.

The branch provided representation on three federal-provincial committees which dealt with low level radioactive waste management, hazardous waste management and amendment of the Environmental Contaminants Act (Federal) and preparing the Clean Air Act and/or the Clean Water Act.

EARTH SCIENCES DIVISION

The Earth Sciences Division is responsible for environmental protection of soils and groundwater. Major activities include: developing land-related waste disposal techniques; monitoring of geological disturbances and groundwater resources; studies on acid deposition; administering the Ground Water Development Act; providing information through the Groundwater Resources Information Services; operating an earth sciences related laboratory; and conducting landfill and waste impoundment investigations.

The division has three branches: Soil Protection Branch (Lethbridge), Groundwater Protection Branch (Edmonton and Lethbridge) and Hydrogeology Branch (Edmonton and Calgary). These branches provide soils and groundwater-related services to the general public, local municipal authorities, industry, other government agencies and divisions within Alberta Environment.

Groundwater Protection Branch

The Groundwater Protection Branch continued to provide province-wide investigative and consultative services in the areas of shallow groundwater contamination, shallow groundwater quality monitoring and groundwater seepage problems. Major programs included evaluations and monitoring of modified and regional landfill sites, investigations of irrigation headworks, monitoring of shallow groundwater contamination and the review of country residential subdivision applications.

Landfill Investigations: Hydrogeological investigations at prospective regional and modified landfills were continued as a service to local governments. Investigations are conducted to ensure that landfills are located in areas where the risk of groundwater contamination is low. In the landfill site selection process, hydrogeologic constraint maps, office evaluations and site specific hydrogeologic testing are employed. Reports containing results of hydrogeological investigations were prepared for 13 prospective regional and 33 modified landfill sites in the province.

Permanent groundwater monitoring systems have been established at 16 regional and three modified landfills. Monitoring activities typically consist of recording water levels and collecting groundwater samples for chemical analysis. Monitoring results for each regional landfill

are reported annually.

A final report containing the results of additional hydrogeological work at six priority one landfill sites was completed. The report concludes that groundwater contamination around the sites does not pose a threat to human health or the environment.

Irrigation Headworks: This program includes investigations of soils and shallow groundwater conditions along canals operated by the department. The intent of such investigations is to locate and define the extent of existing or potential canal seepage. The results are used to design interceptor drains, canal linings, relocation alternatives and other means of controlling canal seepage.

Reports were completed for Reach 5 of the Lethbridge Northern Irrigation District Headworks Canal and also for a major section of the United Irrigation District Main Canal. Other seepage control studies were undertaken for a number of seepage-affected areas identified along the Bow River Irrigation District Headworks Canal and along the Western Irrigation District Headworks Canal system. Post-construction evaluations to study the effectiveness of seepage control measures implemented within the rehabilitated sections of the Lethbridge Northern Irrigation District Main Canal system were continued.

Shallow Groundwater Contamination: Branch personnel assisted in the investigation of 17 contamination problems related to petroleum leakage from underground storage tanks and continued groundwater monitoring at two additional sites. One exploratory drilling program was conducted when a private well was contaminated by gasoline.

Data collection continued for the underground petroleum storage tank inventory program being conducted in southern Alberta. Branch staff continued their active involvement in provincial and national programs addressing underground storage tanks.

Groundwater monitoring programs were reviewed for 15 industrial sites. Industry was requested to assess and control two new groundwater contamination problems.

Industrial Plant Monitoring: Branch personnel provided technical assistance to regulatory authorities in evaluating groundwater monitoring proposals and data from industrial plants. To obtain a Licence to Operate pursuant

to the Clean Water Act, groundwater monitoring is required around most industrial facilities. In the past year, groundwater monitoring proposals and/or monitoring data were reviewed for approximately 25 industrial plants (predominantly sour gas plant facilities).

Country Residential Subdivisions: A total of 85 technical submissions supporting country subdivision applications were reviewed and evaluated. Several meetings were attended to discuss groundwater availability and related subjects with municipal councillors and staff.

Soil Protection Branch

The Soil Protection Branch, with its mandate to monitor Alberta's soil resources, works toward the prevention of soil pollution and, where pollution occurs, assists in developing clean up methodology and verifies clean up. The branch has expertise in soil chemistry, soil physics, soil microbiology, soil pollutant chemistry and land use capability. Major branch programs relate to the land spreading of municipal and industrial wastes, soil effects from acidic deposition, reclamation and earth sciences related laboratory support.

Land Spreading of Municipal and Industrial Wastes: Investigations into the suitability of land spreading of wastes included wastewater and sludge from both municipal and various industrial sources.

Studies were started in the Calgary and Edmonton areas to determine the levels of plant nutrients and heavy metals added to the soil from sewage sludge application. A study was also started to assess waste suitability for land application using biological toxicity testing techniques.

Soil Acidification: Activities in this program related primarily to monitoring acid deposition.

The sixth year of soil sampling was completed for the long-term soil acidification monitoring program. This program, designed for 44 years of monitoring, measures sensitive soils in areas near sources of acid-forming emissions as an early warning to potential long-term effects over larger areas.

Reclamation: Reclamation work has been directed toward effective field investigations for identifying soil contaminants, clean up criteria, and clean up verification.

A study to assess various treatments in improving salt-affected mine spoil at an abandoned coal mine at Bow City was completed. The study showed that the replacement of topsoil was the most effective means of treatment in re-establishing vegetation and that calcium chloride was the most effective additive to improve the sodium-affected spoil.

Investigations at the abandoned Lethbridge Canadian Pacific Railway's marshalling yard identified areas with diesel fuel, heavy metals, elemental sulphur and various scrap. The study will continue to assess three field investigative methods with the aim of identifying which is best for determining soil contaminants.

Laboratory and field work was undertaken to determine the amount of elemental sulphur that can be left in sulphur base pads, and still be reclaimed with lime, without adverse soil, plant or groundwater impact.

Analytical Support: Laboratory analyses of soil, water, plant and waste materials were conducted in support of divisional programs and, to a lesser extent, for other agencies. A total of 16,000 samples were analyzed for over 120,000 parameters. Of these, about 81,000 and 39,000 measures were made on 12,900 soil and 2,700 water samples, respectively.

Hydrogeology Branch

The Hydrogeology Branch has a mandate to address hydrogeological, geological, geophysical and geochemical concerns with emphasis on groundwater development and protection. Major programs of the branch are the enforcement of the Ground Water Development Act, operation of observation well networks, compilation and dissemination of groundwater information, geophysical monitoring, hydrogeological mapping, liaison with the water well drilling industry and various applied earth sciences research programs.

Inspection Service: The inspection service is responsible for the administration and enforcement of the Ground Water Development Act and Regulations. The legislation ensures proper groundwater protection by regulating the construction of water wells. Semi-annual, on-site inspection of all licenced contractors is conducted by five inspectors, who also offer technical assistance to drilling contractors by means of geophysical logging, video camera inspections and advice in water well construction, repair and maintenance.

The inspectors also conducted investigations of well complaints related to poor well construction, interference from oil industry activity (in co-operation with the ERCB) and in Disaster Assistance Claims under the 1986 Flood Recovery Program.

Groundwater Information: The Groundwater Resources Information Services expanded the data file by over 5 per cent through an increase of incoming documents such as driller's reports (from 248 licenced water well drillers), geophysical logs, water chemical analyses and coal test hole logs. Complete sets of microfiche of the Central Data File (274,418 open files) have been distributed to the division's regional offices in Lethbridge, Calgary and Red Deer for public use. From the inception of this microfiche system, complete or partial sets have been acquired by 32 drillers and consultants.

The 1986 Bibliography of Alberta Groundwater Reports was completed. It lists over 3,500 reports and is available on 31 microfiche, by author and NTS map sheet. Most of the reports are also available on microfiche.

The service had a 6 per cent increase in inquiries over the previous year, indicating that the data base is well recognized by the private, industrial, consulting and public sectors as the primary source of groundwater information in Alberta.

Oldman River Seismicity Monitoring: The branch established a three-station seismicity monitoring array in the vicinity of the Oldman River Dam which is currently under construction. The purpose of the array is to monitor any induced seismicity which may result from the filling of the reservoir scheduled to start in 1992. The array has been integrated with the nearby Turtle Mountain seismic array, using low-power UHF radio telemetry, and all sig-

nals are recorded by a state-of-the-art microcomputer-controlled base station.

Cold Lake Seismicity Monitoring: A six-station telemetered seismic monitoring array was established in 1981 to investigate earth movements in the Cold Lake area. System operation and preliminary data processing were undertaken by Alberta Environment with data interpretation by the University of Alberta (under a research grant from Esso Resources Canada). Based on six years of operation, it was determined that virtually all felt events were sonic events relating to nearby military activity. In addition to many distant earthquakes and nuclear tests, approximately 330 small local seismic events were recorded. The largest seismic events detected had a Richter magnitude of 1.6, therefore posing no danger to surface or sub-surface installations. Since Alberta Environment's original objectives for the project have been met, the system was closed down on February 1, 1987.

Turtle Mountain Study: The multiphased monitoring program on Turtle Mountain is designed to detect any movements within the mountain which may be preliminary to further large rock slides. Part of the program includes an automatic recording weather station near the summit of Turtle Mountain with movement gauges attached across the main crack, in addition to normal meteorological sensors. The data is regularly transferred by a radio telephone link to a computer in Edmonton. In the event of unusual movement, this system allows minute by minute monitoring of rock movement from a remote location. Monitoring technology developed in this study have direct application wherever the need for earth or rock movement monitoring exists. Stress release, due to the continued collapsing of the old Frank Mine within Turtle Mountain, is monitored by a six-instrument seismicity monitoring array. This system, which is integrated with the new Oldman River Dam seismicity monitoring array, has its recording base station at the Frank Slide Interpretive Centre.

To date, no significant movement on Turtle Mountain has been recorded. Although a few earth tremors appear to have occurred within Turtle Mountain, they are too few and small in magnitude to be of concern.

Hydrogeological Cross-sections: A series of 20 hydrogeological cross-sections consisting of eight continuous hydrogeological profiles covering NTS map sheets 72E, L and M and 82H, I and P on a 1:250,000 scale were completed. The cross-sections show subsurface geology and stratigraphic correlations. All interpretations are based on geophysical log control and lithologic data, major aquifers and water well information which includes well completion, water level, calculated long-term well yield and water chemistry. A recommended "base of groundwater protection" is shown. The "base" defines the approximate depth at which groundwater has a total dissolved solids content of less than 4,000 milligrams per litre. A written report to accompany the cross-sections is being prepared.

Additional cross-sections covering map sheets 73D and E were constructed in 1986 and are currently in the drafting stage.

The profiles will be completed over the remainder of the settled area of the province in the next three years.

High Quality Water Sampling: A province-wide groundwater quality monitoring project was started in 1985. The purpose of the project is to determine, using strict sampling protocol, the natural groundwater quality for specific aquifers.

A total of 77 wells were sampled, including 35 that had been sampled the previous year. Duplicate sampling is required to ensure the results represent the true natural groundwater quality.

The water analysis consists of 18 routine parameters, 14 trace heavy metals, total organic carbon and chemical oxygen demand. Nine parameters are measured in the field using a mobile laboratory.

In conjunction with this sampling, a study is being conducted to determine if the type of well casing influences water quality. Six wells at three sites in the Edmonton area were sampled monthly for this purpose and also to determine seasonal water quality variations.

Provincial Observation Well Monitoring: This activity consists of obtaining data on the water levels in over 180 wells equipped with continuously recording devices. The wells range in depth from 5.2 to 285 metres and are designed to intercept specific water-producing zones or aquifers. Most aquifers used for domestic and industrial supplies are monitored.

The monitoring data indicates a lowering of groundwater levels only in the vicinity of major groundwater withdrawals. In most areas, the water level fluctuations are uniform within an expected range.

RESEARCH MANAGEMENT DIVISION

The objectives of the Research Management Division are to provide timely and authoritative scientific and technical advice and information to other operational divisions within Alberta Environment; to co-ordinate the environmental research requirements of the department with external agencies; and to plan and carry out research on environmental matters that are pertinent to departmental and provincial needs.

In order to carry out these objectives, the division combines diverse skills such as project management, budgeting and financial control, contracting and publication editing with comprehensive knowledge in many scientific areas pertinent to the field of environmental research. The division's expertise, which allows for a comprehensive approach to environmental problem solving, is drawn from such areas as hydrology, climatology, pedology, biology, chemistry, meteorology, ecology and sociology.

The organization of the division merges a functional management mode comprised of four scientific systems or groups (air, human, land and water) with a number of well-defined scientific research programs in a matrix structure. This flexible structure provides an interdisciplinary approach to environmental problems where required. For instance, the division's work in the area of acid deposition includes research on the complex interface between the atmosphere and biosphere, that is, how air quality affects soils, water and vegetation.

During the 1986-87 fiscal year, the division's research programs included: acid deposition; air quality/climate; biophysical resources; environmental contaminants; water treatment and waste management; water resources; and environmental emergencies and risk assessment.

Each program is defined by a comprehensive descriptive document that is updated regularly in order to keep its objectives current. Environmental concerns in Alberta are continually being examined and may be incorporated at any time into the division's active programs, or new programs may be developed. Budget funds are allocated to each of the programs on the basis of priorities determined by the senior management of Alberta Environment.

In its research service role within Alberta Environment, the division provides co-ordination and man-

agement of all of the department's environmental research and ensures that the available research dollars are spent on activities that respond to high-priority needs. To this end, the division acts as a co-ordinator for research carried out on behalf of the department at the Alberta Environmental Centre in Vegreville. As well, divisional staff constantly interact with other line divisions of Alberta Environment in order to keep programs current and of direct applicability to the department.

Proposals for projects are usually solicited by the division according to identified research needs. However, unsolicited proposals are also considered and may be funded if they deal with priority issues.

During the fiscal year, the division managed 41 scientific contracts, ranging from major interdepartmental and interdisciplinary projects, such as the Cold Lake Hydrology Study, to the organization of workshops and the publication of monographs.

Thirteen final reports on research projects were published by the division during the year, and a number of articles stemming from division projects appeared in scientific journals or conference proceedings. Additionally, researchers submitted interim or progress reports, which are not published, on long-term projects. Staff also published material internally, through other agencies and in conference proceedings or journals. With the consolidation of oil sands research, the Mildred Lake Camp facility and the Fort McMurray Division office were closed in 1987, as their existence was no longer cost effective. The savings were redirected into other acid deposition research in the oil sands area which continues to be a priority in the research program.

Research Programs

Acid Deposition Research: This program involves research on the environmental impact and the medium- to long-range transport of acid-forming emissions (oxides of sulphur and nitrogen). The research will provide information that will help Albertans understand the potential effects of acid-forming emissions on soil, water, vegetation and human health. Results will be used to evaluate and refine Alberta's air quality standards and to help plan provincial industrial development.

Research is conducted in three program areas:

1. An effects program is designed to determine the potential impact on the northern forested areas of the province, including the oil sands areas.
2. The Western and Northern Canada Long-Range Transport of Air Pollutants (W&NC-LRTAP) program involves co-operative research with British Columbia, Saskatchewan, Manitoba, the Northwest Territories and Environment Canada. The objective is to investigate the medium- and long-range transport of air pollutants and their possible environmental effects. This will provide information for the development of regulatory and control strategies to prevent environmental damage due to acid deposition.
3. The Alberta Government/Industry Acid Deposition Research Program (AG/IADRP) is an \$8-million project of Alberta Environment, the Energy Resources Conservation Board and the electrical utilities companies, designed to assess the effects of acid-forming gases on the environment and human health.

The biophysical research component concentrates mainly on agricultural areas in the southern part of the province. The first critical phase of the biophysical research involves: (a) a characterization and quantification of local and regional air quality and an assessment of the potential impact on the environment; (b) an inventory of sulphur dioxide and nitrogen oxide emissions in Alberta; and (c) a world literature review on the effects of acid deposition on vegetation, soils and surface and groundwaters.

In the human health component of the program, the Medical Diagnostic Review was carried out under the auspices of ADRP but was funded by Alberta Social Services and Community Health (now Occupational and Community Health) for \$3.7 million (over and above the \$8-million commitment). The Medical Diagnostic Review was successfully completed and included the comprehensive medical examinations of over 3,600 people in southwestern Alberta. No significant health differences were found between the health of people in an area impinged by plumes from sour gas plants when compared to the health of people living in control areas.

Air Quality/Climate: The objectives of the air quality subprogram are to characterize and quantify atmospheric pollutants and delineate their effects on air quality, the environment and climate. Research, at this time, is focussed on priority concerns, such as flaring, urban air quality and fugitive and uncontrolled emissions. Research results will be used to determine the best possible management strategies and regulatory controls required to prevent or mitigate degradation of air quality.

The climate subprogram addresses the impact of climate variability on the management and development of Alberta economic and human resources. Recommendations from the subprogram will be used to develop and implement strategic plans to minimize the potentially adverse impact and maximize the positive impact of climate variability. This will complement the Canadian Climate Program as recommended by the Canadian Council of Resource and Environment Ministers. The Alberta Climate Advisory Committee co-ordinates research on a provincial

and national level. This committee is interdepartmental (Environment, Agriculture, Forestry, Lands and Wildlife and the Alberta Environmental Centre) with representation from Atmospheric Environment Service (Environment Canada); the Alberta Research Council; the Canadian Petroleum Association; the Alberta Climatological Association; and the academia.

Biophysical Resources: This new research program combines reclamation and geoscience subprograms with two new subprograms of biotechnology and resource inventory. During 1986-87, only reclamation and geoscience research involved active projects.

The reclamation research subprogram identifies better methods of reclaiming disturbances created by activities such as mining, drilling and pipeline construction. For example, research is being done to determine methods of rebuilding productive soils; to identify changes in surface water and groundwater after disturbance and reclamation; to develop native plant species for reclamation; to control erosion; and to improve materials handling operations.

The interdepartmental Reclamation Research Technical Advisory Committee (RRTAC) sets research priorities that are reviewed each year. RRTAC members are from Alberta Environment, Alberta Agriculture and Alberta Energy and Natural Resources and from the Alberta Research Council.

In 1986-87, RRTAC committed about \$1.2 million from the Heritage Savings Trust Fund to reclamation research. Government and industry committees co-ordinate research in three biophysical regions: plains; mountains and foothills; and northeast Alberta. Final reports on this research are available from the Queen's Printer.

The geoscience research subprogram co-ordinates research on natural phenomena, such as landslides and earthquakes, which may pose a threat to human life and property. Research on natural resource development and land use and their impact on the environment is also addressed. The subprogram encompasses research in the areas of geology, geophysics, civil engineering and soil science.

Environmental Contaminants: The objectives of this program are to identify and evaluate contaminants within Alberta and accumulate data on their fate and effects in the environment.

There are five subprograms in place under Environmental Contaminants: Oil Sands Extraction and Discharge; Pesticides; Organic Pollutants; Heavy Metals and Other Ions; and Decommissioning Activities.

The framework of each subprogram contains mechanisms for the identification and setting of priorities for contaminants. Consideration is given to the generation, co-ordination and integration of information required to manage contaminants. Mechanisms are included for the implementation of recommendations and mitigative measures generated from these procedures.

Research activities within this fiscal year were focussed on priority concerns within the subprograms of Oil Sands Extraction and Discharge, Pesticides and Decommissioning. Under the subprogram of Oil Sands

Extraction and Discharge, research was executed on issues such as fish tainting, persistence and movement of contaminants (fugacity) and the fate of oil sands tailings contaminants. The subprogram Pesticides contained projects on aquatic macrophyte control, insect spraying activities and fish toxicity studies; decommissioning activities included projects for phosphogypsum and an inventory of underground storage tanks.

Results and recommendations from all research projects are being used to develop mechanisms to set priorities, develop and implement protection plans and specify environmental criteria in order to determine the best management strategies to limit environmental degradation.

Water Treatment and Waste Management: This program attempts to co-ordinate all Alberta research aimed at improving the understanding of the principles of water and wastewater treatment technology and waste disposal. The objectives of the program are to address public concerns and to develop technology for water and waste treatment.

The program is directed by a Program Planning Committee with line division representation and has defined major research thrusts toward pulp and paper wastewater treatment options; *Giardia* detection and control methodology; and various industrial and municipal water and wastewater treatment technologies.

Pulp and paper research centered on an evaluation of wastewater treatment options for the chemithermomechanical pulping process, while *Giardia* research at the Kananaskis Centre has continued with the development of detection techniques and assessment of some conventional and unconventional potable water treatment options. A major international conference on *Giardia* detection and water treatment was held in February, 1987.

Finally, microbial degradation techniques for the decomposition of hydrocarbon contaminated soils in Alberta were reviewed as were various potential oil sands tailings pond treatment technologies.

Water Resources Research: Under this program, research is carried out on the quantity and quality of surface water and groundwater and on the impact of industrial developments and activities on water resources.

Research on water quality aspects include ion and nutrient budgets of Alberta lakes and control of aquatic weeds and salinization along irrigation conveyance systems.

A project studying the physical phenomenon of snowmelt infiltration into frozen prairie soils has resulted in the capability to forecast soil moisture conditions of prairie soils in early spring.

Two major programs were jointly funded with the Alberta Research Council: (1) the Hydrogeology of the Cold Lake Area, which is investigating the groundwater flow regime on a regional scale and the impact thereon of in-situ heavy oil exploration activities; and (2) the Co-operative Program in Surface Water Engineering which is studying such issues as bedload and scouring in gravel bed rivers, riverbank erosion and protection, development and implementation of a computerized river data base and river ice formation and breakup processes.

Environmental Emergencies and Risk Assessment:

The objectives of this subprogram are to identify and evaluate risks from uncontrolled releases of pollutants into the environment and to develop strategies to protect the environment in emergencies. These objectives will be reassessed following a review of research in the summer of 1987.

Environmental Information: The objectives of this subprogram are to identify environmental issues of public concern and to identify the policy implications of all research results. A comprehensive systematic review of studies in several disciplines will facilitate a systematic evaluation of all research into environmental attitudes.

WATER RESOURCES MANAGEMENT SERVICES

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Water Resources Management Services is responsible for the overall management and development of water resources within the province and for water resource matters held in common with other provinces and the federal government. The objective is implemented by its five divisions: Planning, Design and Construction, Technical Services, Water Resources Administration and Operation and Maintenance.

In 1986-87, the Assistant Deputy Minister served as chairman of the Oldman River Dam Review Board and represented Alberta Environment on the Alberta Water Resources Commission. Representing the province, he also served on the Mackenzie River Basin Committee and the Prairie Provinces Water Board.

Alberta Water Resources Commission (AWRC)

The services contributed in 1984 to the AWRC's review of water management strategy in the South Saskatchewan River Basin by publishing background reports and assisting with public hearings. In 1986, the AWRC completed its review and released a report with its recommendations.

The services also contributed to an AWRC review on the drainage feasibility of potential agricultural land in northern Alberta. The review report by AWRC reached the draft completion stage.

Prairie Provinces Water Board (PPWB)

The PPWB is composed of representatives of the three prairie provincial governments and the federal government. Established in 1948, it administers the 1969 Master Agreement on Apportionment of eastward flowing rivers and makes recommendations on water resources that concern more than one jurisdiction. During the year, the principal activities affecting Alberta were:

Apportionment Administration: The board approved a Hydrometric Monitoring Program for 1987-88. It reported no apportionment problems in the year in spite of the drought conditions in southern Alberta the previous season. Work also continued on development of a process to formalize the use of water quality indicators to monitor interprovincial border concerns.

Committee on Hydrology: The committee approved a study of a wind data base and analysis program for design purposes on lakes and reservoirs, and its first phase was completed. A "Handbook for the Administration of the Apportionment Agreement" was prepared for the board, as well as a document summarizing committee activities from 1972 to 1985.

Committee on Groundwater: With the completion of two hydrogeologic profile reports along borders, committee members undertook to review all groundwater concerns within 20 kilometres of their common borders. No groundwater diversions of note were found on the Saskatchewan side of the border.

Committee on Water Quality: The committee updated the Inter-provincial Water Quality Contingency Plan which was then adopted by the board. It discussed monitoring improvements on the Beaver and North Saskatchewan Rivers, reviewed spill reports and dealt with the definition

and reporting process for spills. The Rationale Document for Beaver River Water Quality Indicators was sent for review by PPWB members. Other work included preparation of a fact sheet, a review of analytical methods and approval of site-specific water quality indicators at 11 provincial border stations.

Mackenzie River Basin Committee

In 1984, Alberta, British Columbia, the Northwest Territories and Saskatchewan began bilateral discussions toward implementing transboundary water management as recommended by the 1981 Mackenzie River Basin Study Report. In 1986-87, discussions with British Columbia were temporarily suspended but considerable progress was made with the Northwest Territories in technical areas. The committee developed a proposal for the participating governments to cost share an integrated hydrometric, meteorologic and water quality monitoring network for the basin.

Significant Programs and Activities

A major program of water management in southern Alberta is directed to the securing of water supplies for irrigation, municipal, industrial, domestic and recreational uses and to the rehabilitation of irrigation headworks and canal systems. In 1986-87, a major irrigation project was the construction of the Forty Mile Coulee Reservoir, an internal water storage supply for the St. Mary River Irrigation District. Extensive rehabilitation was also carried out to portions of the main canals of the St. Mary River and Lethbridge Northern Irrigation Districts.

Implementation of the Oldman River Dam Project continued. Engineering tasks included: construction of a site access road, installation of a work camp complete with all facilities, the awarding of contracts for the design and fabrication of spillway gates, control valves and stoplogs and the start of diversion tunnel excavation. In planning, an exhaustive two-year inventory of the fish, wildlife and vegetation resources in the project area was completed, as well as an assessment of the recreational potential of the reservoir surroundings. Also completed were an inventory of historic and pre-historic resources and a study of the suitability of land for irrigation around the reservoir and damsite.

Continued implementation of the 1985 Cold Lake-Beaver River Long Term Water Management Plan this year produced development of agreements for management of lake control structures and guidelines for in situ oil sands plants covering water recycling, groundwater management and subsurface wastewater disposal.

In northwestern Alberta, a major water management planning study focussed on agricultural water problems. Work was substantially completed in six subbasins. The plans are for use by local and provincial government officials.

In July, 1986, the service closely monitored floods in north-central Alberta, the most severe being on the Pembina River and on the North Saskatchewan River. The River Forecast Centre supplied early warnings containing forecasts of the timing and height of water level rises. The services assisted Alberta Public Safety Services in the processing of 265 appraisals of losses or damages sustained by municipalities or individuals. Of 102 projects requiring departmental sponsorship in flood restoration or rehabilitation, 66 were completed by year end.

TECHNICAL SERVICES DIVISION

Survey Branch

The branch provides land and water surveys to the department. Data collected are used for the investigation, implementation and management of departmental projects, for the management of the province's water resources and to contribute to the data base of land survey and hydrometeorological information. The branch carries out its responsibilities through two sections, the Land Survey Section and the Water Survey Section. The branch also operates the Technical Services Division Records Centre, which provides land survey and hydrometeorological data and related information to users throughout the department, to consultants and to the general public.

Land Survey: Engineering and control surveys were performed and arrangements were made for legal surveys, aerial photography and mapping services for the department. Projects totalled 612. Contracted services cost \$825,390.

Some of the larger projects for which surveys were carried out were: Pembina River Flooding; Parlby Creek/Spotted Lake; Kimiwan/Winagami Canal; United Irrigation District Main Canal; and the Lethbridge Northern Irrigation District Main Canal.

Automation of engineering surveys for design continued with the acquisition of a total station EDM and a microcomputer system.

Water Survey: Hydrometeorological data were gathered by the section's field staff and through two federal-provincial cost-sharing agreements.

During 1986, the following data collection stations were operated by section staff:

- Lake level	225 stations
- Recording streamflow or water level	65 stations
- Non-recording streamflow	56 stations
- Miscellaneous streamflow	38 stations
- Snow courses	134 stations
- Snow pillows	14 stations
- Non-recording precipitation	15 stations
- Recording precipitation	31 stations

Major floods in the North Saskatchewan and Pembina River basins were also monitored by section staff.

Under the terms of the Federal-Provincial Cost-Sharing Agreement for Meteorological Programs and Stations 25 stations were operated at a cost of \$11,097. Under the terms of the Federal-Provincial Cost-Sharing Agreement for Water Quantity Surveys, 499 stations were operated. Alberta's share of the costs in 1986-87 was \$947,000. This cost does not include \$15,700 repair costs for stations that were damaged in the 1986 floods which occurred in July.

Expansion of the real-time hydrometeorological network by the installation of an additional satellite data-collection platform and nine landline systems brought the total to 88 stations. Data-gathering activities continued in the Peace Athabasca Delta and in the Spring Creek Research Basin.

Hydrology Branch

The branch is responsible for providing hydrological engineering analyses of the surface water resources of the province. This responsibility includes the determination of annual and seasonal volumes of streamflow, the magnitude and frequency of extreme events such as floods and droughts and the provision of information and analyses for water management projects such as river basin planning, reservoir design and lake stabilization. The branch also assesses both the natural and man-altered environmental characteristics affecting streamflow.

During the year, 272 requests for service were handled for other divisions and departments by the branch. The subject matter ranged from the hydrologic review of Ducks Unlimited projects to the determination of the probable maximum flood for the Milk River dam site. Major studies were undertaken on a wide variety of subjects, such as natural flows, water balances and probable maximum flood analyses. Examples follow:

The Probable Maximum Flood for the Milk River Site '2' Dam Study provides the probable maximum flood for the Milk River above the Town of Milk River.

The Historical Weekly Natural Flows for Stimson and Pekisko Creeks Study produced a set of weekly natural flows at locations within Stimson, Pekisko and Willow Creeks, which are suitable for assessing water demand versus water supply for these basins.

The *Milk River Basin Weekly Streamflow Study* produced both the recorded and naturalized weekly streamflows for assessing the hydrologic feasibility of placing a proposed reservoir on the Milk River, as well as for conducting assessments of instream flow requirements.

The *Probable Maximum Flood for Beaver Creek Site 'A' Dam Study* provides the probable maximum flood estimates for Beaver Creek at the proposed dam site.

The *Hutch Lake Water Balance Study* provides an assessment of how the lake will operate after the construction of the proposed dam. This information provides a basis for the development of recreational facilities and input into the water quality analyses.

The *Kneehills Creek Natural Flows Study* produced natural mean monthly records along Kneehills Creek for assessing the water availability in the basin, using the active licences within the watershed.

An assessment of the present water licencing scenarios in Ross Creek and Bullshead Creek near Medicine Hat was completed. A map presenting withdrawal locations and drainage areas for approximately 700 water licences was done. A hydrology report was produced which presents the expected volume of water available at each licenced location for future use.

A Probable Maximum Flood Workshop was jointly sponsored by the branch and the University of Alberta. The workshop was in two parts: part one was on probable maximum precipitation and part two was on probable maximum flood – SSARR hydrologic modelling.

River Engineering Branch

The branch provides expertise in the area of river morphology and dynamics. General areas handled by this branch include: river erosion protection and river training; flooding analysis and preparation of flood risk maps for land bordering on rivers and lakes; design and analysis for flood reduction schemes; ice jam monitoring and control at freeze-up and breakup; evaluation of the impact of water management works (dams, weirs, etc.) on the existing regime of the rivers; river engineering input to permitting of gravel mining, pipeline crossings, bridges, culverts, intake and outlet work; and river data collection (flood and erosion surveys).

Erosion Protection and River Training: Problem evaluation and preliminary design reports related to river erosion, sedimentation and stabilization were prepared for 38 projects. Major projects included: the production of erosion protection brochures for Shorelines and River Banks; Battle River Basin Study – River Engineering Assessment; U.I.D. Headworks Modification Study; Sunset House Flood Control; West Prairie River Pipeline Exposure; Swan Delta Flood Relief; Clearwater Dike Project; and Milk River Dam – River Regime Assessment.

Flood Risk Analyses: Maps are prepared to show flood-prone areas so that land development can take flood risk into account, resulting in reduced loss of human life and property. Major reports were: Fort MacLeod Floodplain Analysis; Red Deer River and Red Deer Floodplain Mapping; Canmore Flooding Assessment; and Red Deer River – Flood Levels for Residences below Dickson Dam.

Seventy-six subdivision applications were assessed for flood risks as an input to planning commission work, and studies of flood potential were done at 33 other locations.

Ice Jam Monitoring and Control: Both breakup and freeze-up ice fronts were monitored at the Town of Peace River and at Fort McMurray. Extensive work was done with the Alberta/B.C. Hydro Joint Task Force for the Peace River to set the freeze-up level of the Peace River at Peace River.

Ice monitoring was done on the North Saskatchewan River at Rocky Mountain House and on the Red Deer River downstream of the Dickson Dam.

Assessment for Permits and Licences: Twenty-seven bridge/culvert crossings, 34 sand and gravel permit applications, 26 pipeline crossings and 57 miscellaneous permit and/or licence applications were reviewed during the year.

River Forecast Centre

The River Forecast Centre monitors river streamflow conditions, provides flood forecasts for disaster prevention and flood damage reduction and provides water supply forecasts to enable optimal management of the water resources of the province.

Streamflow Monitoring and Forecasting: The centre continuously monitored weather, snowpack and streamflow conditions throughout the province in order to prepare flood and water supply forecasts and to advise a variety of agencies regarding changes in river levels.

Impending flood situations resulting from rainfall or melting snow were detected and analyzed, and warnings of expected high river levels were disseminated to a variety of other agencies responsible for flood damage prevention and flood event analysis.

A record flood occurred along the Milk River in late February, 1986, as a result of rapid snowmelt in the headwaters of the basin. This event also affected the St. Mary, Belly, Waterton and Oldman rivers, as well as small streams in the Pincher Creek area.

In late May, 1986, a major flood occurred in the headwaters of the Bow River as a result of rapid snowmelt in the mountains.

In July, 1986, a major rainfall flood occurred along the Red Deer, North Saskatchewan, Pembina, McLeod and Athabasca rivers.

In late September, 1986, a rainstorm in the Cypress Hills area of southeastern Alberta caused flooding along several of the streams flowing out of the hills.

Information was provided to a number of communities which discharged sewage effluent into various rivers. On occasion, the centre also provided information to construction firms working in the floodplain of a river to warn of expected sudden changes in river level.

The centre monitored streamflow conditions at Alberta's borders to enable the province to satisfy the terms of interprovincial and international agreements. The Master Agreement on Apportionment defines specific flow rates and volumes of water in interprovincial streams which must be delivered to the Province of Saskatchewan. An international agreement covers the apportionment of

the waters of the St. Mary and Milk rivers at Alberta's southern border.

The centre's responsibility for acquiring data related to water management operations and for providing real-time information to water managers has grown with Alberta Environment's increasing water management activity.

Weekly river reports on current river conditions and expected trends for many of the most important streams in Alberta were produced and disseminated to a variety of interested agencies, both in government and in the private sector. In addition, a public information service for canoeists and other recreational interests was provided through an automatic telephone-answering device.

Water Supply Forecasting: The centre issued and distributed the "Water Supply Outlook for Southern and Central Alberta" in co-operation with the Survey Branch on a monthly basis from March to August. An annual summary report was also published.

Water supply conditions in southern and central Alberta during the summer of 1986 varied considerably from one month to the next and from one basin to the next. There were serious water supply problems in the Oldman River basin during the month of July, but above normal rainfall in August and September alleviated the problem during the late summer. The 1986 "Water Supply Review" report documents this situation.

Climatic Network and Data Acquisition: Data from Alberta Environment's real-time hydrometeorological network have been used extensively and have proven to be extremely valuable for flood and water supply forecasting. Planning continues for the gradual expansion of this network into other areas where the present data base is inadequate to support satisfactory river forecasting service.

DESIGN AND CONSTRUCTION DIVISION

The Design and Construction Division provides engineering services for water supply and control projects. Projects include works for water supply, storage and distribution, drainage, flood and erosion control, lake level stabilization and rehabilitation of irrigation headworks systems.

Division staff carry out field investigations and prepare detailed geotechnical, hydraulic and structural plans. They also manage projects, administer contracts, supervise construction and provide quality control. The division operates a materials testing laboratory and provides drafting services. The Land Services Section negotiates land use agreements, appraises lands and administers Crown lands which relate to the department and its projects.

Geotechnical Branch

The branch provides geotechnical engineering services for departmental projects, including geological engineering and geotechnical investigations, assessments and designs. The branch prepares preliminary design reports, detailed designs, contract documents and cost estimates for division projects. Geotechnical engineering and technical reviews are done for other divisions, departments and agencies.

The branch through the Land Services Section negotiates land use agreements, carries out land appraisals and administers Crown lands of interest to the department.

Construction continued on the Forty Mile Coulee Project. The project is 60 per cent complete, with substantial completion expected by August, 1987.

Geotechnical Design Section: The section produces preliminary and final geotechnical designs and contract drawings for departmental water resource projects.

During the past year, the branch completed a total of nine preliminary and 20 final geotechnical designs for a variety of projects such as the rehabilitation of existing irrigation headworks systems, flood protection diking, erosion control structures, boat launches and slope stabilization.

Major geotechnical studies completed included the design of a 25-metre high earthfill dam on Beaver Creek, a 13-metre high earthfill dam on the Little Bow River and a 16-metre high earthfill dam on Squaw Coulee. Final designs and contract drawings which were completed

included the Lethbridge Northern Irrigation District Main Canal, the Reach 4 and Waterton-St. Mary Main Canal and the Pinepound Coulee Syphon Replacement projects.

The section also performed 36 geotechnical reviews for other divisions. These reviews included assessments of proposals for water supply pipeline routes, mine tailing disposal sites, river bank stabilization and subdivision development.

Geotechnical Services Section: This section provides for site investigations, air-photo interpretation, material testing and managing geotechnical consulting contracts for branch projects.

Investigation Unit: This unit does site reconnaissance, drilling and field testing, installing instrumentation and monitoring water resources projects. Geotechnical investigations were completed for 22 projects during the reporting period.

Drilling, testing, instrument installation and monitoring were done on four projects for the Geotechnical Branch, other branches and for consultants doing studies for the department.

The unit maintains an inventory of gravel, sand and rock for projects throughout the province. Granular searches were completed for 11 projects.

Materials Testing Unit: This unit tests soil and does quality control inspections during construction.

The laboratory completed work on 22 projects and provided quality control services on six projects.

Field laboratories were maintained at the Lethbridge Northern Main Canal Rehabilitation project and at Forty Mile Coulee projects.

Land Services Section: This section is responsible for: land use agreements; processing damage claims; representation of the department at Land Compensation Board hearings; initiation of land acquisitions; and land budget requirements. This section appraises land related to reclamation projects.

The Land Services Section maintains files on all Crown land titled to Alberta Environment and administers leases and easements related to these lands. This section also maintains a library of Land Compensation Board decisions and court cases.

Design Branch

The branch is responsible for the hydraulic and structural designs and the drafting of water control and conveyance projects. The branch, in co-ordination with the Geotechnical Branch and input from the Technical Services Division, prepares preliminary engineering designs, reports and detailed project designs, construction contract documents and cost estimates. The branch does engineering designs and technical reviews of water-related projects for other divisions and departments. The branch also provides photographic and drafting services to the department.

On major projects, Design Branch staff perform project manager roles. The following project synopses reflect on some of the key projects which are phased for construction over more than one fiscal year.

Lethbridge Northern Main Headworks System: This project involves the rehabilitation and expansion of about 80 kilometres of irrigation main canal and associated structures, improvements to the diversion headworks and raising of Keho Lake. It is scheduled for completion in 1989.

Construction work on 10 canal reaches totalling 67 kilometres was completed by March 31, 1987. The design work on the last remaining 12.6-kilometre-long reach of canal was also completed. The construction work on this reach is scheduled to start in September, 1987.

The construction work on Keho Lake dikes outlet work and peripheral roads is complete. The work associated with the relocation of Keho Lake Park and Golf Course was essentially completed.

Waterton-St. Mary Headworks System: The Design Branch prepared contract documents for a single cast-in-situ concrete barrel which will replace the existing deteriorated twin barrel wood stave syphons. The syphon, which is 5.715 metres in diameter, will convey irrigation water across Pinepound Coulee at a maximum discharge of 90.6 m³/s (3,200 cfs). The project is estimated to cost \$4.10 million and is scheduled for tendering in June, 1987.

Parlby Creek Channel Improvement and Buffalo Lake Stabilization Project: This project, which is located about 50 kilometres east of Lacombe, is designed to control up to the one-in-five-year-flood level (25 centimetres) and will provide drainage to alleviate flooding of valuable farmland. It will also enhance waterfowl and wildlife habitat. Phase two, consisting of Parlby Creek channel improvement and the Spotted Lake outlet structure, was designed, tendered and awarded at \$865,000.

Phase three design work was also undertaken, which involves channel improvements from Spotted Lake to the Highway 50 bridge. The channel, which included improvements to Spotted Creek, was designed to handle the one-in-five-year flood of 16 centimetres.

East Bonanza Drainage: This project is located approximately 50 kilometres northwest of the town of Spirit River in Improvement District No. 20. Final design was prepared for the project to provide drainage of agricultural lands thereby permitting earlier cultivation. This effectively extends the crop-growing season, a factor very important in the Peace River region.

Willow Creek Basin-Pinepound Coulee Reservoir: This proposed project is located 17 kilometres northwest of Claresholm, Alberta.

Two alternatives were investigated for water storage in the Willow Creek Basin. Off-stream storage was examined in the Pine Coulee, which would store 49,000 dam³ of water and provide a water area of 590 hectares. The cost of this alternative was estimated at \$29,500,000. On-stream storage in Willow Creek and Pine Coulee was examined, which would provide 72,000 dam³ of water and a water surface area of 470 hectares at a cost of \$34,500,000.

The stored water is intended for water supply to nearby communities. If approved for construction, the reservoir will also provide recreational use.

Clear Lake Diversion: This proposed project is located approximately 20 kilometres east of the town of Stavely. A feasibility report on diverting flows from Mosquito Creek by canal to Clear Lake was prepared. This multipurpose project will supply water for agriculture and waterfowl habitat enhancement if approved for construction.

Beaver Creek Dam: A preliminary study of a dam across Beaver Creek in Sec. 10, Tp. 9, Rg. 29, W4 was evaluated.

The proposed reservoir has a storage capacity of up to 2,375 dam³, which would be used to supply stock water during dry periods and would also permit the development of a small amount of irrigated agricultural land.

The dam would consist of an earth embankment 25 metres high, a concrete service spillway, a riparian outlet and an emergency spillway. The estimated cost of this project is \$3.4 million.

Drafting Pool: The drafting pool, with offices located in Edmonton, Lethbridge, Peace River and Calgary, provides diversified drafting services to the department.

The Structural Drafting Section prepared construction drawings for many water resources related projects, with a major input for the rehabilitation of the LNID Headworks system.

Other drafting areas performed topographic, hydrographic and map drafting. Computer plotting of survey data was being used at an increasing level. The construction of aerial photo mosaics, the design and layout of display material and graphical representation was also done.

Photographic services were provided in support of drafting.

Construction Branch

The branch manages construction and administration contracts for the construction of water management projects. In 1986-87, the branch worked on 40 projects involving an expenditure of \$17.7 million. Branch staff are also involved with multidisciplinary teams which are developed for the implementation of major water management projects.

Drumheller Flood Control Project: Located in the city of Drumheller, the project involves the construction of dikes on the Red Deer River to provide flood protection to the city. A multiyear project, the first phase constructed in 1986-87, involved the building of 440 metres of protective dike.

Pigeon Lake Stabilization Project: Located 65 kilometres south of Edmonton, the project involved the building of a stabilization structure on the outlet of the lake to control the lake water levels.

Winagami-Kimiwan Canal: Located southeast of the town of McLennan, the project involved the rehabilitation of the water supply canal from Winagami Lake to Kimiwan Lake.

Lethbridge Northern Irrigation District Main Headworks System: Located west of Lethbridge, work continued on this multiyear project, involving the rehabilitation and expansion of the main canal.

Office of the Director

The Director of Design and Construction is a member of the Irrigation Council and is chairman of the Irrigation Implementation Committee and Forty Mile Coulee Independent Review Board.

WATER RESOURCES ADMINISTRATION DIVISION

The Water Resources Administration Division is comprised of the Office of the Director, four branches and five regional offices. Under the authority of the Water Resources Act, the Water Resources Regulations, Provincial Water Power Regulations, the Dam and Canal Safety Regulations and the Drainage Districts Act, the division is responsible for administering and enforcing the water resources legislation regulation, policies and programs such as the Alberta Water Management and Erosion Control Program which provides financial assistance to local authorities. Services are extended to the general public, local authorities, industry, other government departments and divisions within the department.

Water Rights

The Surface and Ground Water Rights Branches are responsible for processing applications under the Water Resources Act for licences to divert and use surface water and groundwater. Terms and conditions for the licences are prepared through liaison with other agencies and input from private individuals or groups. Files and plans are maintained for all projects and the quantity of water consumed is monitored by field inspections and mailed water-use returns.

Surface Water Rights Branch

During the fiscal year, activity related to new projects was down slightly from the peak level year established during 1985-86, but the number of modifications related to existing licences was higher (see tables 7 and 8).

The moratoria on further processing of licence applications in the Willow Creek, Highwood River and Milk River basins were retained throughout 1986-87, except for small domestic, stockwatering and necessary municipal purposes.

The Water Management Study for the Pekisko-Stimson Basin was continued, and staff provided input through the technical advisory committee. Major input from staff was required for the Miller Western CTMP Pulp Mill in the Athabasca River Basin.

Hydro-electric Section: The Hydro-electric Section is responsible for the administration of the Provincial Water Power Regulations under the Water Resources Act.

Field inspections were conducted to monitor progress at hydro-power maintenance projects and to ensure compliance with licences and regulations. During 1986-87, TransAlta Utilities completed the lining project on the Spray Canal, riprap placement on Interlakes Dam and the concrete pier nosings at the Kananaskis Development. Modifications to improve the probable maximum flood capabilities at the Bearspaw, Ghost, Ghost River Diversion and Cascade developments are proceeding.

Staff have been involved with numerous land transactions regarding Crown lands, particularly at the Rundle and Brazeau developments. Ice and flow conditions on the North Saskatchewan, Bow and Kananaskis rivers were monitored during the winter.

Net hydro-electric generation in the province for the past five years was:

Year	Megawatt-Hours
1981	2,027,000
1982	1,584,000
1983	1,473,000
1984	1,420,000
1985	1,385,366
1986	1,821,670

Groundwater Rights Branch

The Groundwater Rights Branch progress report indicates a significant increase in licencing activity for 1986-87 (see tables 9 and 10). The number of interim and final licences issued increased by 95 and 40 per cent respectively. The number of exploration permits issued also increased by 20 per cent.

Field inspections conducted during 1986-87 remained the same as for the previous year. Of the 224 inspections, 185 were carried out under Section 33 of the Water Resources Act and 39 were either complaint investigations or inspections made to obtain information regarding applications for exploration permits or licences.

Regional Services Branch

The Regional Services Branch administers and enforces the Water Resources Act, provides financial assis-

tance to local governments and municipalities, technical assistance for farm water management projects and inspects water-related problems.

The five branch offices are located in Peace River, Edmonton, Red Deer, Calgary and Lethbridge. The regional offices are responsible for authorizing nonconsumptive uses of water as required by the Water Resources Act and undertaking inspections for the Water Rights Branch to assist them in issuing consumptive use authorizations. In addition, letters of authority, authorizing temporary withdrawals of water, are issued. Regional offices are also responsible for investigating violations of the Water Resources Act and commencing court actions where appropriate.

Financial assistance is provided to local governments and municipalities under the Alberta Water Management and Erosion Control Program. The Alberta Government contributes 75 per cent of engineering and construction costs, except in the case of drainage projects which improve agricultural land or agricultural production. For the latter, 86 per cent of construction and engineering costs are provided. Projects eligible for assistance include flood and erosion control, drainage, flow regulation, water-based recreation, wildlife enhancement, sources of water supply and water management overview studies.

Under the Farm Water Management Program, the regional offices provide technical assistance to landowners who wish to construct a water management project. This assistance includes survey and design services required to construct the project.

Support is provided to the department's Planning Division in major studies.

Table 11 summarizes regional activities for the year.

Peace River Region: The 1986-87 fiscal year began with an uneventful spring run-off through most of the Peace River region. The Fort Vermilion/La Crete area saw slightly heavier run-off conditions. This area received 13 to 15 centimetres of rain at the end of June. By summer's end, they had received approximately 50 centimetres of rain. This is quite high for an area where the mean annual precipitation is 35 centimetres. The rest of the Peace River area did not receive an excessive amount of rainfall.

Inspections and licencing operations remained par to the levels dealt with in recent years. A total of 317 inspection requests were received. There were 316 inspections conducted and 282 technical reports processed. The Farm Surface Water Management and Erosion Control Program accounted for 81 inspections received and Water Rights accounted for 49.

The region issued 21 licences for nonconsumptive projects, 130 permits and 17 letters of authority for temporary water withdrawals.

Under the Alberta Water Management and Erosion Control Program, a record number of projects were constructed. During the year, 21 projects were cost shared and another 20 projects were fully funded.

Edmonton Region: An extremely high amount of precipitation in July resulted in extensive flooding in west central Alberta. The most severe flooding occurred along the Pembina and North Saskatchewan rivers. In most areas

along the Pembina River, the flood event exceeded the 1:100 year return period. A Flood Recovery Program was implemented by the province to provide assistance for flood damage and loss. Staff time and consultant assistance was required for inspections and appraisals under the Flood Recovery Program. The region received 163 appraisal requests under the program and inspected 122 claims during the fiscal year.

The Edmonton region received 555 requests for field inspections on other water control and water management problems; 70 requests were related to alleged violations under the Water Resources Act. During the 1986-87 year, 525 field inspections were completed. As of March 31, 1987, a total of 101 requests were outstanding and required an inspection.

The Edmonton region received 63 new licence applications and 222 new permit applications during the 1986-87 year. A total of 58 interim licences, 56 licences and 216 permits were issued. Thirteen licence applications were cancelled. The region also issued 31 letters of authority for temporary water withdrawals. As of March 31, 1987, there were 14 outstanding licence applications and 11 outstanding permit applications that required processing.

During the reporting year, 34 projects were funded in the region. Of these projects, four were fully funded by the province. The remainder were cost shared with local authorities under the Alberta Water Management and Erosion Control Program.

Twenty-eight new requests were received under the Farm Surface Water Management Program. Twenty-six surveys and 10 designs were completed. Construction was undertaken on 10 projects. In addition, 95 Farm Development and Reclamation referrals and Soil Conservation Project referrals (Alberta Agriculture) were reviewed. Inspections were carried out on 12 referrals.

The Edmonton region prepared one court brief for enforcement cases relating to violations under the Water Resources Act. The region was involved in one prosecution under the Act.

Red Deer Region: Spring run-off was generally near normal during the 1986-87 season, however, summer rains caused extensive flooding and erosion along the Red Deer River and its tributaries.

There were 259 new inspection requests; approximately 10 per cent were from the Water Rights Branch and 10 per cent were flood recovery related. The region completed 233 inspections, leaving 43 outstanding at the end of the year. One enforcement problem was submitted to the enforcement committee and is being prepared for prosecution under the Water Resources Act.

A total of 34 Farm Surface Water Management Projects were initiated during the year, 17 were designed and four were constructed. Approximately 91 projects were under investigation at the end of the year.

Regional staff issued 139 permits and 14 letters of authority. Three licences and five interim licences were issued for nonconsumptive projects.

Under the Alberta Water Management and Erosion Control Program, eight projects were constructed and 27 others were under review.

Calgary Region: An earlier than normal spring run-off occurred in February in the Special Areas and plains areas of the Bow River Basin. Precipitation was above average throughout the Bow Basin in May. Cool, wet weather dominated the first half of the month, reaching a climax with a late spring blizzard at mid-month, which dumped large amounts of snow on the plains areas. Most of the mountain snowpack had melted by the end of May. June and August precipitations were generally below normal. July and September precipitation was well above normal in the basin. Precipitation for July was 145 per cent of average and precipitation for September was 384 per cent of average in Calgary.

The summer of 1986 was also one of above-average precipitation for the Special Areas. Precipitation accumulation for a number of climate stations in the vicinity of the Special Areas was generally average in May and June and above average in July and September. Two dry spells in the Special Areas occurred in August and mid-October.

During the 1986-87 fiscal year, 31 projects were under review for cost sharing under the Alberta Water Management and Erosion Control Program. Construction work was completed on six projects.

The Calgary Region issued 105 permits and five interim licences for nonconsumptive projects under Section 11 of the Water Resources Act. A total of 263 inspections were completed for consumptive use water projects, nonconsumptive use water projects, enforcement under the Water Resources Act and complaints related to surface water.

Under the Farm Surface Water Management Program, five requests were received and two designs were prepared.

Lethbridge Region: High precipitation in the autumn of 1985 finally brought some relief for the agricultural community in 1986, although the problems that were highlighted in the previous year largely remain.

Spring breakup occurred in late February, with some flooding experienced on the St. Mary and Oldman rivers due to ice jam formation.

Summer rainfalls, however, were sparse again, and water shortages were experienced in the Little Bow River and Willow Creek basins. An open and mild winter reduced soil moisture substantially, which resulted in extensive soil drifting during the spring of 1987.

Inspection activities decreased somewhat because the historical backlog has been eliminated. Requests received for the year totalled 314, and a total of 252 inspections were completed, leaving 105 to be held over for the following year. Under our Farm Surface Water Management Program, 26 requests were received and 19 reports prepared for the applicants. In addition, 41 referrals from Alberta Agriculture dealing with similar on-farm water management concerns were processed.

For this report period, the region received 40 applications for permits and nine applications for nonconsumptive use licences. The region issued 38 permits and 10 licences. There were nine letters of authority for temporary water withdrawals issued in the Lethbridge region over the past fiscal year.

Under the Alberta Water Management and Erosion Control Program, seven projects were commenced. Two of

these will continue into the next fiscal year. Project start-up was delayed on two projects, and 10 projects are under investigation for future consideration.

Dam Safety Branch

The Dam Safety Branch reviews designs for dams referred by the Controller of Water Resources and monitors the safety of existing dams. The branch operates under the authority of the Dam and Canal Safety Regulation which applies to dams that are at least eight metres high or have a reservoir capacity of at least 62,000 cubic metres. In 1986, about 1,300 dams met these criteria.

During 1986, the Dam Safety Branch reviewed designs submitted for 50 water rights licence applications. Twenty inspection reports were also reviewed including those on the ongoing construction of the tailings ponds for Suncor and Syncrude tar sands plants.

In 1986, 109 dams were inspected at locations ranging from the Cypress Hills to Fort McMurray. Instrumentation was installed at Paddle River and Pinepound Coulee dams, and instrumentation was read at several projects including Dickson and Paddle River dams and the major Irrigation Headworks dams. A performance report was prepared for Dickson Dam based on instrumentation readings and inspections by Dam Safety staff. Several consultants were contracted to perform independent inspections and to write safety evaluation reports for Waterton, St. Mary, Pothole, North and East Ridge, North and South McGregor and Paine Lake dams. Work continued on computer programs for reducing and plotting instrumentation data.

During the fiscal year, the branch hosted the Alberta Dam Safety Seminar. This seminar consisted of 32 presentations on a wide variety of relevant subjects, extensive displays and a field trip to Paddle River Dam. Two hundred participants attended from Canada and the United States, representing governments, dam owners, universities and consultants.

Administrative Support Branch

This branch is responsible for the overall budget, financial management, personnel administration, purchasing, accounts payable, inventory control, records management control and consultant contract administration for the division. It provides administrative and advisory support to the nine drainage districts in Alberta and co-ordinates requests for flood analyses and the appraisal of damage claims if required by Alberta Public Safety Services.

Financial Administration Section: This section is responsible for the preparation of the yearly divisional budget, monthly budget forecasts, purchasing documents, accounts payable, personnel administration, payroll, contract administration, inventory control of fixed assets including EDP hardware and software, attractive items and controlled numbered forms. It also co-ordinates accommodation, parking, vehicle rental and office automation for the division.

Records Administration Section: This section is responsible for the creation, maintenance, retrieval, control and disposition of records. These records pertain to the management and licensing of the water resources in the

province. They are used mainly by the Water Rights Branch and Regional Services Branch in the administration of the Water Resources Act and Groundwater Development Act. Drainage district records which are used by Drainage Council in the administration of the Drainage Districts Act are also maintained in this section. Records are stored in three main media - paper, microfilm and computer. Table 12 illustrates the work performed and a comparison of increases/decreases over the previous two years.

Alberta Public Safety Services: The branch head, as a member of the Disaster Assistance Committee, was involved with Alberta Public Safety Services in co-ordinating the evaluation of six storms and flood events. In addition, two hundred and sixty-five inspections of flood-related incidents were investigated at the request of Alberta Public Safety Services.

Table 7: Surface Water Rights Progress Report

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Water Power	Other	Storage	Natural State	Dvrsn.	Total 86-87	Total 85-86
Applications received	0	24	130	39	198	0	17	39	0	113	560	583
Interim licences issued	0	23	83	252	10	0	23	32	0	113	536	539
Interim licences re-issued	0	12	99	598	11	0	15	8	0	0	743	706
Licences issued	0	10	64	219	11	0	20	23	0	97	444	585
Licences re-issued	0	7	64	585	9	0	3	5	0	2	675	618
Permits issued	0	92	0	0	291	0	198	0	0	0	581	694
Transfers	0	0	12	216	1	0	1	2	0	0	232	507
Cancellations	0	4	28	44	8	0	7	3	0	0	94	133

Note: Statutory purpose domestic was changed to agricultural on June 8, 1984, for all surface water rights projects.

Table 8: Surface Water Rights in Good Standing as of March 31, 1987

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Water Power	Other	Storage	Natural State	Dvrsn.	Total 86-87	Total 85-86
Applications	0	25	294	27	11	1	26	47	0	139	570	518
Interim licences	0	33	361	126	19	1	32	85	0	594	1,251	1,183
Licences	0	284	2,082	6,297	333	8	95	570	1	798	10,468	10,058
Net Totals	0	342	2,737	6,450	363	10	153	702	1	1,531	12,289	11,759

Note: Statutory purpose domestic was changed to agricultural on June 8, 1984, for all surface water rights projects.

Table 9: Groundwater Rights Progress Report

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Other	Dvrsn.	Storage	Total 86-87	Total 85-86	Total 84-85
Exploration permits issued	7	19	3	55	49	7	3	0	143	118	141
Applications received	12	57	4	56	38	8	6	0	181	164	190
Interim licences issued	9	70	2	78	19	14	0	0	192	99	262
Interim licences re-issued	3	82	1	14	3	6	0	0	109	86	129
Temporary permits issued	2	0	0	0	25	0	7	0	34	62	72
Temporary permits re-issued	0	2	0	0	4	0	1	0	7	10	12
Licences issued	22	160	2	68	34	25	3	2	316	226	262
Licences re-issued	1	16	0	1	4	0	0	0	22	15	28
Transfers	0	3	0	6	7	2	0	0	18	18	32
Cancellations	4	18	3	4	11	0	0	0	40	50	78

Table 10: Groundwater Rights in Good Standing as of March 31, 1987

	Dom.	Mun.	Irgtn.	Agr.	Ind.	Other	Dvrsn.	Storage	Total 86-87	Total 85-86	Total 84-85
Applications	0	4	1	2	8	3	0	0	18	332	261
Interim licences	23	171	4	64	53	21	3	1	340	484	653
Licences	102	566	20	673	477	65	19	7	1,929	1,624	1,395
Temporary permits*	6	3	0	0	277	0	39	0	325	-	-
Net Totals	131	744	25	739	815	89	61	8	2,612	2,440	2,309

* Temporary permits were removed from the application stage into a separate category effective March 30, 1987.

Table 11: Summary of Regional Activities 1986-87

	Peace River	Edmonton	Red Deer	Calgary	Lethbridge
Inspections					
Requests received	317	718	259	287	314
Number conducted	316	647	233	263	252
Water Resources Act					
Licences issued	21	114	8	5	10
Permits issued	130	216	139	105	38
Letters of authority	17	31	14	37	9
Water management projects					
Alberta water management and erosion control program	21	30	8	1	7
Farm water management program					
Requests received		28	34	5	26
Designs completed		10	17	2	13
Enforcement					
Alleged violations		70		22	20
Cases resolved regionally				12	19
Cases reviewed by enforcement committee				2	0
Court briefs prepared for prosecution		1		0	0

Table 12: Summary of Records Administration Section Activities

Fiscal Year	Files Created	Reports Indexed	Files Retrieved	Plans Filmed	Images Produced	16 mm Images Produced	Micro-jackets Produced	Duplicated Film Produced
1984-85	709	365	44,800	4,495	11,134	148,711	4,168	26,631
1985-86	818	445	42,654	3,249	6,875	212,225	5,756	53,188
1986-87	648	335	48,118	4,666	7,962	328,355	12,403	63,980
Records disposition								
1984-85 - 345 1/2 cubic feet								
1985-86 - 67 cubic feet								
1986-87 - 125 1/4 cubic feet								

PLANNING DIVISION

The Planning Division has responsibility for river basin and regional water resource planning, water management project planning, water use forecasting, economic analysis, environmental impact assessment and mitigation planning for water resource projects and miscellaneous special water resource programs and support services.

Three branches implement the division's activities: Southern Region (Oldman, Bow and Red Deer River basins); Northern Region (North Saskatchewan, Athabasca and Peace River basins); and Planning Services. During the year, division staff managed consultant contracts worth approximately \$2.4 million.

River Basin Planning

River basin planning deals with the water resources of a basin as a system. Basin studies cover water supplies and demands, environmental needs, water resource conflicts and other water-related factors. A basin plan recommends ways of meeting future needs, resolving allocation and environmental problems, and provides rational guidance for the development of water resource projects. Plans are updated periodically to account for changing conditions.

Athabasca River Basin Planning Program: A detailed program was prepared, and implementation began. Ultimately, the program will document all aspects of the basin water resources.

An overview study of the water quality in the Athabasca River was prepared. Its first stage emphasized problem prevention and the establishment of water quality guidelines for the river. Background studies continued on pollutant loadings and the impact of both hydrocarbons and potential fish tainting compounds in the river.

Also completed was an economic forecast for the basin, using varying growth scenarios. The forecast provides outlooks for industrial, agricultural, municipal and natural resource sectors for a 20-year period and will serve as background information for other Athabasca River Basin planning projects. A water use study documenting historical and forecast use of water in the basin was subsequently concluded.

Battle River Basin Study, Phase III: An economic analysis of the potential benefits for agriculture and indus-

try of increased base flow in the river was completed. A draft report incorporating the economic analysis, together with component studies on hydrology, water balance, forecast water use, fisheries, aquatic vegetation, recreation and engineering costs, assessed the feasibility of augmenting frequent natural low flows.

Cold Lake-Beaver River Basin: Implementation of the Cold Lake-Beaver River Long-term Water Management Plan continued. Agreements for the long-term ownership, operation and maintenance of lake control structures were completed. Studies were undertaken to formulate guidelines for groundwater management and subsurface disposal. Water recycling guidelines for wastewater from in situ oil sands plants were completed and will be reviewed by the oil industry and government agencies before implementation.

North Saskatchewan River Basin Planning Program: A phased program was developed to integrate public participation and technical input to a basin plan by 1989. In continuing basin work, an overview study of agricultural flooding and drainage problems was completed. Also prepared was an inventory of potential flow regulation and hydro-power sites in the basin for use in water balance modelling to predict downstream flows from alternative headwater storage schemes.

Two computer models were developed for predicting river water quality under future basin development and water management scenarios. One simulates dissolved oxygen and nutrient levels in the river and specific contaminants. The other simulates the impact of urban storm events and industrial spills on river water quality.

South Saskatchewan River Basin: The Alberta Water Resources Commission completed its review of basin water management strategy and released its findings in the publication, "Water Management in the South Saskatchewan River Basin, Report and Recommendations."

Regional Water Resource Planning

This type of planning is similar to river basin planning, but its scope is confined to a smaller geographic area, usually a subbasin.

Highwood River Instream Flow Needs: A study was completed defining the relationships between Highwood River flows and the habitat requirements for sportfishing. Instream flow needs are important to decisions on modifying headworks or operating guidelines for the diversion of water from the Highwood River into the Little Bow River basin. This study will be used to help set those operating guidelines for water management in the basin. Meanwhile, monitoring of flow and water quality conditions continued.

McLeod River Basin: Coal mining and forestry development forecasts were translated into assessments of potential run-off impact on the water resources in the basin. Water balance modelling runs were undertaken, incorporating these potential effects. Suspended sediment data were also collected and compiled.

Northwest Alberta Subbasin Water Management Planning Study: Study teams completed work on six sub-basins, focussing on agricultural drainage problems. The objective is to develop water management plans for use by local governments or provincial agencies. Draft reports were completed.

Methods applicable to large numbers of water management units were developed for evaluating the economic impact of various levels of drainage on agricultural production and wildlife habitat.

Willow Creek Basin: Completion of storage investigations together with an economic analysis showed that the Pine Coulee off-stream storage site was superior on technical, social and environmental grounds. There is strong local and municipal support for the storage development project.

Little Bow River Basin: Storage site investigations and an economic analysis were concluded with the selection of a site below the junction of Mosquito Creek and the Little Bow River. Study results were presented at four open house sessions jointly sponsored by the local advisory committee and the department. There is strong local support for the storage development.

Pekisko-Stimson Creek Basins: A water management study for these tributaries of the Highwood River was initiated. The study will identify and evaluate means of managing water for the benefit of irrigation, stockwatering, fishing and recreational interests.

Ross Creek Basin: A comprehensive draft report dealing with water management issues was completed. The future water management implications of the report are under review by senior management.

Sylvan Lake Water Use Study: Current and forecast water demands in the Sylvan Lake area were documented and balanced against existing and future supplies. A report now in preparation will address the need for additional future water supplies.

Kneehills Creek Basin: The first phase of a water management plan was completed. Investigations began covering an inventory of water supply and demand, identification of problems and conflicts and formulation of options for their resolution. Development of terms of reference for assessment of water management alternatives also commenced.

Special Areas Water Management: A study examined the technical and economic feasibility of supplying

water for up to 40,000 acres of irrigation development in the Municipal District of Acadia Valley and for municipal use by communities along Highway 9 between Youngstown and Oyen. Potential sources of supply investigated were diversion from the Red Deer River to satisfy both demands and supply of treated water from Hanna to satisfy the municipal demand alone.

Etzikom Coulee: Investigations of water quality and supply problems along Etzikom Coulee continued. A local advisory committee worked with department staff to identify and assess measures to improve water quality and secure supplies for stockwatering, wildlife and existing irrigation users. The study will consider a modest expansion of water uses in the area.

Project Planning

Project planning deals with site-specific water management problems. It often entails evaluation of alternative structural and operational water management proposals. It may also include provision of support services once a project is under design or construction.

Kimiwan Lake Management Study: This study commenced with the objective of reaching a consensus on water management levels in the lake, which has significant waterfowl breeding and staging habitat.

Pine Lake Regulation: The report on the possibilities of regulating the level of Pine Lake was completed. Due to limited benefits and general lack of economic viability, it was decided that this project would not be implemented at this time.

Little Fish Lake Regulation Study: An investigation examined the possibility of regulating the level of the lake by diversion from the Red Deer River. Diversion from the Sheerness water line was also investigated. The study findings are now under review.

Drumheller Flood Control: Implementation of the dike in Newcastle was completed. A detailed feasibility study of the Drumheller "D" dike was concluded and another was initiated for the East Coulee Dike.

Elbow River Floodplain Management: A committee composed of members from Alberta Environment and the City of Calgary continued preparation of a floodplain management plan.

Gull Lake Flood Control: A study to investigate the technical and economic feasibility of an outlet control for Gull Lake was completed. These results are now being reviewed.

United Irrigation District Main Canal Sizing: A planning report was completed to assess alternative configurations and sizing of water delivery facilities. Final sizing was recommended.

Milk River Dam and Reservoir: The Province of Alberta and the Government of Canada continued with detailed site-specific studies of three possible reservoir sizes. Economic evaluation and size optimization studies for the proposed storage reservoir were completed. Other studies completed were water quality, winter fisheries, aquatic habitats and fish resources, rare flora and fauna, geological and palaeontological impacts, historical resources impacts, consumptive water use, reservoir sedi-

mentation, river regime impacts and weekly natural streamflows. As well, technical meetings were held with officials from the State of Montana and the United States Federal Government.

Beaver Creek: An economic assessment of a proposed storage reservoir was undertaken.

Fort McMurray Floodplain Management Study: The joint Alberta Environment/City of Fort McMurray study was completed and submitted to the Minister and the Mayor of Fort McMurray for their review. A \$50-million flood protection dike has been proposed for the Lower Townsite and Waterways areas of Fort McMurray.

Minnie Lake-Village of Glendon Water Supply: A report was completed recommending that the Village of Glendon obtain its water supply from its existing well and cease withdrawing water from Minnie Lake. Other recommendations were that no additional surface water should be added to the lake and its water levels should be monitored for one year after withdrawals cease.

Whitford-Rush Lakes Water Management Plan: Geotechnical and planning studies resulted in a compartmented water management plan estimated to cost \$3.8 million. The Local Advisory Group endorsed the plan, which was then turned over to Water Resources Administration Division for implementation.

Vermilion River: The Morecambe structure was originally built in 1976 to relieve flooding in the Two Hills floodplain. This year, an operating strategy for the structure was drafted to enhance the department's capability to reduce flooding in both the Two Hills and Mannville floodplains by better use of the storage potential of the Vermilion Lakes.

Big Lake: The Big Lake Technical Advisory Committee of the Edmonton Municipal Regional Planning Commission considered several management options for this lake located immediately upstream of St. Albert on the Sturgeon River. Of specific interest was the Wetlands for Tomorrow concept of compartmenting Big Lake with dikes to enhance waterfowl habitat. Should this option be proposed for implementation, water balance analysis will be undertaken to ensure there are no negative impacts on the downstream floodplain.

Environmental Mitigation Planning

This planning is carried out at the project implementation stage. The objective is to identify opportunities for environmental enhancement stemming from the construction of water resource management works and to ensure that adverse environmental effects of the project are properly mitigated during and after construction.

Oldman River Dam and Reservoir: Work continued on the impact assessment and mitigation design phase for the Oldman River Dam and Reservoir. Emphasis was on the fisheries, wildlife and cultural resources at the project site.

Also completed were an analysis of recreation and tourism resources and a recreational development opportunities study.

Forty Mile Coulee: Work continued on the Forty Mile Coulee Reservoir project. Identification of mitigation and enhancement opportunities included studies on archaeo-

logical resources, fish rearing ponds, serviced recreation areas and water supply to waterfowl habitat areas.

United Irrigation District Headworks and Canal Rehabilitation: Environmental mitigation studies were begun to identify the impact of rehabilitation on ecological and historical resources and to recommend methods of reducing negative project effects.

Fishways: The Planning Division assumed chairmanship of the Fishways Working Group, an interdepartmental and intergovernmental advisory body. The performance and design of fishways at the United Irrigation District Weir, Chappell Lake and McCullough Lake were evaluated. Alterations to improve their performance were recommended as required.

Hutch Lake: The environmental assessment continued on the impact on ecological and historical resources resulting from a proposed dam and reservoir at the lake.

Data Base and Methodology Development

The effectiveness of the Planning Division is enhanced by the compilation and updating of pertinent water resource data such as water supply and demand. As well, new analytical and predictive methods can improve the evaluation of water resource management alternatives.

Water Quality: The two computer models developed for predicting water quality in the North Saskatchewan River are sufficiently flexible for use in other western prairie rivers, giving the division significant additional capability in water quality planning.

Economic Evaluation Methods: A method for estimating the value of water-based recreation on storage reservoirs was tested at Dickson Reservoir. The results of the survey were used to obtain a profile of reservoir users and estimate user days and to determine the direct benefits of recreation at the reservoir.

Industrial Water Use Survey: The questionnaires for the 1986 Industrial Water Use Survey were designed in co-operation with Environment Canada. Administrative arrangements for distribution of the survey were completed.

Water Use Information System: Entry of historical water use data into the Water Use Information System continued. Reports of historical water use were requested by, and supplied to, various agencies.

River Trip Survey and Recreation Classification System: Work continued on the River Trip Report Card Survey intended to establish flow requirements for boating on rivers. A draft report of a proposed system of river classification for recreation was prepared.

Instream Flow Needs Determination: Work continued on new methods for determination of instream flow needs for fisheries.

Other Planning Services

The division provides miscellaneous other services, such as monitoring of water management or related environmental issues, administration of special water management programs, technical support to other government agencies or to community groups and advice and representation on interprovincial water resource matters.

Assistance to Regional and Municipal Planning Commissions: Support was provided for the development of management plans for Sylvan Lake and Big Lake. The County of Strathcona was assisted on recreation plans in the Cooking Lake area.

Supplemental Irrigation in the Peace River Region: A draft paper was completed on the potential demands of supplemental irrigation in the region.

Integrated Resource Planning Participation: Peace River Basin staff assisted in resource evaluation of the following Department of Forestry, Lands and Wildlife planning exercises: recreation sites in the Upper Peace River Valley, local plans at Smoky-Peace Point and in Grande Prairie County West and the East Peace Subregional Plan.

Water Literacy Project: Assistance continued on this three-year project, initiated in 1985, to develop educational material on water resources for use in grades four to 12 curricula. The materials will be developed by the Society, Environment and Energy Development Studies Foundation and has the full support of Alberta Education.

Drought Emergency Water Supply Program: This program, for drought areas throughout Alberta, was successfully concluded following nearly three years of technical and financial assistance to rural landowners and communities in replenishing or replacing their water supplies. Over 5,362 applications were received from individuals, and 42 community water supply projects were assisted.

Water Use Forecasts: Water use forecasts were evaluated for the cities of Fort McMurray, Calgary and Lethbridge and for the Village of Shaughnessy.

Resource Integration Committee: The division represented the department on the committee which provides interdepartmental input to public land use planning in Alberta. Assistance was provided to it in liaison with Alberta Forestry, Lands and Wildlife.

Rocky Mountain House Winter Floodplain Monitoring Committee: Due to mild winter conditions, the committee did not have cause to report any specific local flooding problems related to flow fluctuation and winter ice packing downstream of the Bighorn hydro-power plant on the North Saskatchewan River.

Mackenzie River Basin Committee: Division staff participated in work on transboundary water management agreements between Alberta, British Columbia, the Northwest Territories and Saskatchewan. Considerable progress was made in discussions on technical matters with representatives of the Northwest Territories. The committee developed a proposal for the participating governments to cost share an integrated hydrometric, meteorologic and water quality monitoring network for the basin.

OPERATION AND MAINTENANCE DIVISION

The Operation and Maintenance Division operates and maintains provincially owned water-control structures throughout the province.

The division has three branches and two groups: Irrigation Headworks, Projects Management, Equipment and Materials, Special Projects and Administrative Services.

Irrigation Headworks Branch

The branch operates and maintains irrigation headworks systems serving eight irrigation districts in southern Alberta: St. Mary River (SMRID), Lethbridge Northern (LNID), Bow River (BRID), Western (WID), Mountain View, Leavitt, Aetna (MVLA) and Magrath (MID). Two other irrigation districts, Raymond (RID) and Taber (TID), are served by the SMRID. Some 352,000 hectares (870,000 acres) of assessed irrigation land benefitted from water diverted by the following five provincially owned irrigation headworks systems: Waterton-St. Mary, Carseland-Bow, Western, Lethbridge Northern and Mountain View-Leavitt-Aetna.

The province has not taken over the operation and maintenance of the headworks systems of the Eastern (EID), United (UID) and Ross Creek (RCID) irrigation districts. Under agreements between the province and the UID and RCID, funding was provided for urgent rehabilitation to keep their headworks systems operational. The agreement with the UID expired March 31, 1986, and the agreement with the RCID expired March 31, 1987. The federal government, under terms of a 1973 federal-provincial agreement, began the rehabilitation of the Bassano Dam in the EID.

Rehabilitation work on the LNID included the construction of six bridges, installation of a safety fence at the Monarch check structure, one kilometre of gravity outlet line for a tile drain, syphon turnouts for farmers and a bypass check at Willow Creek flume. Grass was seeded on the new canal and Keho Lake Reservoir right-of-way and area sprayed for grasshopper control. With the raising of the dikes, an additional 35,000 acre-feet of water were stored in the lake. Unlike previous dry years, the district was able to supply an uninterrupted supply of water to its water users.

On the Waterton-St. Mary headworks system, new safety ladders were installed at the Waterton and St. Mary spillways. Also, two kilometres of tile drains were placed, 15 kilometres of canal were resloped and armored, the dike along the Belly River was reconstructed and riprapped to protect the chute from erosion and 15,000 cubic yards of gravel were crushed and stockpiled for maintaining service roads. Alberta Transportation erected a new bridge across the St. Mary spillway.

Rehabilitation works on the Mountain View-Leavitt-Aetna headworks system consisted of rebuilding 100 metres of weak canal banks, raising eight kilometres of canal bank where freeboard was inadequate and providing armour protection of the canal slopes in the Belly River to Payne Lake reach. New stoplogs were fabricated for major check structures.

On the UID headworks canal, flow metering wells were installed, and these are being used by the district's personnel for day-to-day operations.

Maintenance and rehabilitation activities on the Carseland-Bow headworks system comprised the installation of new gate position indicators on the South McGregor and Little Bow outlet structures, riprapping of canal downstream of the Little Bow outlet energy dissipator, placement of bank protection material, road grading, gravelling and structure maintenance.

As in previous years, weir safety and awareness efforts were continued. Posters warning of the dangers of the weirs were printed and distributed to schools, public buildings and water-based recreation clubs in Calgary and the surrounding districts.

On the Western headworks system, canal bank repairs were continued and legal surveys conducted for acquisition of land for the canal right-of-way.

The branch's computer plan retrieval system, which contains data on over 10,000 plans, is fully operational. The computer-generated hydrological weekly report continued to provide required information for the operations of the irrigation headworks systems and the dissemination of vital hydrological information to the irrigation districts.

The land administration section of the branch continued to transfer to the Bow River Irrigation District

required canal right-of-way pursuant to the 1975 provincial-district agreement. The section also processed numerous land use and disposition applications affecting the provincial headworks right-of-way.

A total of 1,375,000 cubic decametres (1,114,000 acre feet) of water was delivered to the irrigation districts in 1986, apportioned as in table 13.

Table 13: Water Delivered to Irrigation Districts During 1986

Irrigation District	Cubic Decametres (dam ³)	Acre Feet (ac. ft.)
St. Mary River (including TID & RID)	640,000	519,000
Bow River	368,000	299,000
Western	162,000	131,000
Lethbridge Northern Mountain View	174,000	141,000
Leavitt-Aetna	19,000	15,000
Magrath	12,000	9,000

Equipment and Materials Branch

The Equipment and Materials Branch provides support to the Water Resources Management Service. The branch has several functions.

Equipment Section: The Equipment Section administers a fleet of approximately 550 units and provides a variety of equipment, both large and small, to the Water Resources Management Service. The section supervised construction of a channel at Rocky Mountain House to alleviate farmers' flooding problems, maintained and gravelled canal banks on the Sheerness Irrigation System, completed the outlet structure at Beauvais Lake, pumped water to landowners in the Pincher Creek area, continued with installation of concrete toilets and other facilities in site development areas, provided equipment in an emergency situation when flooding occurred on the Elbow River at Calgary and continued to assist Special Projects in the mowing and watering of sites in southern Alberta.

Materials Section: With warehouse and yard storage facilities in Edmonton, Lethbridge, Grande Prairie and Peace River, the section manages a materials inventory of approximately \$0.3 million. Management includes the provision of ordering, stockkeeping, warehousing, material sales services and equipment leasing functions directly serving the department's Water Resources Management Services. Receiving and storage services are also provided for all areas of the department as required.

Revolving Fund Accounts Section: The accounts section monitors and processes payments to vendors, sends out invoices to users for items sold or rented, monitors revenue and expenses and reports to management on financial status, as well as preparing and monitoring the Revolving Fund Budget.

Central Vehicle Services: The vehicle co-ordinator for Alberta Environment administers the vehicle pool for the department throughout the province. Approximately

400 vehicles, such as half-ton pick-ups, 3/4 ton pick-ups, suburbans, four-wheel drive vehicles and crew cabs were issued this year on a permanent, seasonal and short-term basis.

Projects Management Branch

The objective of the branch is to operate and maintain provincially owned and cost-shared non-irrigation water management projects. The dams, reservoirs, canals and drainage channels also create wetlands for wildlife habitat and lakes for water-based recreation. Forty-nine water control structures are operated to provide flood control, water conservation, streamflow regulation, lake stabilization, recreation, wildlife habitat and assured water supplies for many towns and villages.

1986-87 was the fourth year of operation of the Dickson Dam. Flows in the Red Deer River this year were the highest on record since the dam was constructed. Sufficient water was released from the reservoir into the Red Deer River, fulfilling our Interprovincial Water Apportionment commitment with Saskatchewan.

The central sector repaired eroded channels and dikes and operated water control structures including Barrhead Water Supply, Thunder Lake, Bigelow Reservoir, Gull Lake, Pigeon Lake and Morecambe Structure. The Pigeon Lake structure was replaced with a new outlet control structure including a fishway and provision for stoplog operations. At Buck Lake, a sheetpile breakwater structure was installed to prevent further shoreline erosion damage which resulted from unusual flood conditions in July, 1986.

Record rainfall on July 17, 1986, created extreme river run-off conditions throughout west-central Alberta. In addition to the Athabasca and North Saskatchewan rivers, one of the most severely affected rivers was the Pembina, which experienced a peak flow that was unsurpassed in the recorded history of the river. The Paddle River Dam reduced downstream peak flows in the Paddle by approximately 50 per cent. Flood-related repair works to approximately 84 projects were addressed, costing in the neighborhood of \$1 million.

The demands for water supplies in the southern sector have been increasing annually, which requires additional inspections and flow data monitoring to ensure proper water resource management. Water diverted and/or released from the Little Bow, Squaw Coulee, Chain Lakes and Cypress Hills projects to meet this demand totalled 47,486 acre feet, in 1986. Late fall rains and flooding in the Cypress Hills area caused limited project damage and lake levels had to be lowered in anticipation of spring run-off. Moderate amounts of water were required for domestic stockwatering supplies, but most of the reservoirs had to be operated for flood control.

Major maintenance in the Peace River and Grande Prairie sectors consisted of road grading and bridge repairs, cleaning fish ladders, monitoring water elevations and adjusting gate settings for various canals, streams and lakes. Grass and brush cutting, weed control, debris removal at structures, resloping eroded areas and other routine maintenance were also undertaken. The Fox Creek Drainage channel was reshaped for one and a half kilometre-

tres, and the Podruzny Drainage channel was rehabilitated. Numerous concrete boat launching pads were built and installed.

The branch operates two lake stabilization projects, Gull Lake, located 12.9 kilometres west of Lacombe, and Lac Ste. Cyr, located 19.3 kilometres southeast of St. Paul. Both lakes are used extensively for recreation such as boating and swimming. Close monitoring of Gull Lake resulted in pumping from the Blindman River between April and May in order to maintain the lake at its target stabilization level. Pumping from the North Saskatchewan River into Lac Ste. Cyr was halted for the season due to a high pollution content in the North Saskatchewan River.

The Emergency Water Supply Program was established to assist and supervise the pumping of water for communities experiencing municipal water supply problems throughout Alberta. In 1986-87, seven communities were assisted with emergency pumping: the towns of Fairview and Spirit River, the villages of Wanham, Alix and Peoria, the City of Grande Prairie and the Loon Lake Settlement.

Special Projects Group

The Special Projects Group implements and manages the following:

Northern Alberta Erosion Control Program: Under this program, improvements were made to 17 kilometres of channel. Activities included brush removal and disposal, regrading channels to handle predicted flows, installing grade control structures, upgrading the flow capacity of road and farm crossings and reclaiming and seeding disturbed areas.

Thirty-three private contractors and equipment owners were engaged to carry out the project rehabilitation requirements. Manpower hired under the Alberta Environment Employment Program was used to complete the labor-intensive work.

Deadfish and Sheerness Water Supply Systems: These water diversion projects are located in the Special Areas, one of the driest regions of the province, which has limited natural run-off and high demand for stockwater, irrigation and domestic water supplies.

The 1986 spring and summer experienced hot and dry weather conditions and, as a result, demand for water was continuous from May 26 to September 10. With no spring run-off occurring, the two major reservoirs, Deadfish and Carolside, started the season at 50 per cent storage.

The Deadfish and Sheerness pumping facilities on the Red Deer River supplied 12,140 dam³ (9,845 acre feet) of water in order to meet the irrigation requirements for 2,320 hectares (5,735 acres), to replenish storage in reservoirs and stockwater impoundments and to provide municipal supplies for three communities, including the Town of Hanna. The associated energy costs to pump this volume of water amounted to \$200,000.

The Site Development Program: Under this program, designated areas at reservoirs and stabilized lakes that are being used as access points for water-based recreation are developed for daytime use by the general public.

During 1986-87, upgrading and development was carried out at Gleniffer Lake/Dickson Dam, McGregor

Reservoir, Waterton Dam, Paine Lake, St. Mary's Reservoir, Paddle River Dam, Figure Eight Lake and the Carseland Weir.

Activities included tree and shelterbelt planting, boat launch construction, toilet construction and installation and existing facility repairs. These activities were completed using permanent staff, private contractors, wage staff and employees available through special manpower programs. Sanitary maintenance was generally carried out by private contractors.

Through this program, 33 day use sites have been established for the public's general use on 21 stabilized lakes and reservoirs throughout Alberta.

Office of the Director

The director is a member of negotiating teams established to settle land-related issues with the Blackfoot and Peigan Indian bands. He is also the department's representative on the government's committee on native land claims and the native career opportunities program committee.

Administrative Services Group

The Administrative Services Group administers division activities related to personnel, finance, staff development and budget. The group also provided financial control for a number of revenue-producing agreements involving the use of provincial water management projects.

ENVIRONMENTAL EVALUATION SERVICES

K.R. Smith
Assistant Deputy Minister

J.M. King
Director
Land Reclamation Division

F.J. Schulte
Director
Environmental Assessment Division

Environmental Evaluation Services regulates resource development by requiring environmental impact assessments for major developments, assessing development, exploration and reclamation applications, dealing with regional planning authorities and the Energy Resources Conservation Board and administering restricted development areas.

In May, 1986, a subsidiary agreement under the Canada-Alberta Accord for the Protection and Enhancement of Environmental Quality was signed between Alberta Environment and Environment Canada. This "Agreement Concerning Environmental Impact Assessments of Projects in Alberta with Implications for Canada and Alberta" will be in force for three years, at which time it will be evaluated by both parties and either renewed by mutual agreement or terminated. The purpose of the agreement is to improve co-operation and co-ordination to avoid duplication of effort and prevent unnecessary delays without creating confusion for the public or developer.

In December, 1986, the Lake Shoreland Development Operation Regulations were repealed. The regulations were approved in August, 1977, by order-in-council and affected 15 lakes that were experiencing severe development pressure. Lake management plans were prepared for each lake, and land use control was formalized through the adoption of area structure plans. Once the affected municipalities had passed the appropriate bylaws, the regulation was amended and specific regulated lake areas were removed from the schedule.

"The Sand and Gravel Development and Reclamation Application Manual" was finalized this year. It is intended to aid applicants in the preparation of development and reclamation applications for sand and gravel operations and to serve as an environmental check list.

A major cleanup program commenced around the Blairmore "Big Pile" coal slack pile and at the historical Greenhills Mine site. This land contained remnants of mining activities, equipment and associated buildings. As a result of the cleanup program, the historic site has been secured and the remainder of the property will now serve a beneficial use to the local citizens.

LAND RECLAMATION DIVISION

The Land Reclamation Division administers the Land Surface Conservation and Reclamation Act and regulations.

The division reviews applications and impact assessments of proposed developments which disturb land and grants conditional approvals which set land reclamation standards.

Staff also carry out inspections, reclamation projects and special studies to enforce and improve reclamation and environmental planning.

This division administers the Surface Reclamation Fund which comprises security deposits paid by the developers to encourage satisfactory reclamation of disturbed land.

Land Conservation and Reclamation Council

The council has the responsibility of ensuring that the construction, operation and abandonment of well sites, access roads, pipelines, transmission lines and sand and gravel, coal and oil sands operations are performed in such a manner as to return the land to the same productive capability that existed prior to disturbance.

There are 21 provincial and 163 municipal government reclamation officers within the council.

During 1986-87, the reclamation officers monitored the construction and operation of 277 major surface disturbances and issued 78 Reclamation Orders and 1,405 Reclamation Certificates on abandoned surface disturbances.

Reclamation Branch

The branch is involved with the actual reclamation of derelict lands and administration of the Land Reclamation Program, funded by Alberta Heritage Savings Trust Fund.

Funding was provided to reclaim 123 derelict sites to some type of beneficial use. Of these, 114 projects were on municipal lands and nine were on Crown land (table 14). The majority of the branch's reclamation projects are abandoned garbage dumps/landfills, sewage lagoons and sand and gravel pits located on municipally owned land.

Table 14: Reclamation Projects 1986-87

Disturbance	Municipal	Public	Green area	Total
Garbage dumps/landfills	75			75
Sewage lagoons	13			13
Gravel and sand pits	10	4		14
Mine hazards	3			3
Coal mines	3			3
Water reservoirs	6			6
Access roads	1		3	4
Miscellaneous	3	4	2	9
Totals	114	8	5	127

Regulated Operations Branch

The branch co-ordinates a comprehensive review and prepares operational conditions for development and reclamation approvals of major pipelines and gravel operations. The branch also co-ordinates the review of electric transmission line applications and makes recommendations for ministerial approval.

Since the Sand, Gravel, Clay and Marl Surface Operations Regulation was enacted in 1982, a major function of the branch has been to notify pit operators of the regulation and help them to obtain the required approvals.

Linear Projects Section: This section is responsible for the department's review and approvals process for high voltage electric transmission lines and oil and gas pipelines as referred by the ERCB. Section staff represented the Crown at four ERCB pipeline and transmission line hearings.

The section reviewed ERCB applications and evidence presented at hearings with regard to matters of environmental protection. Recommendations for ministerial approval and development and reclamation approval were prepared.

The section is completing a number of pipeline studies which are under review by industry and groups representing landowners. This consultative approach should improve understanding and co-operation between the gov-

ernment and landowners and the oil and gas industry on environmental issues.

Transmission Lines: The section reviewed 17 applications for electric transmission lines, a decrease of 19 from the previous reporting period.

Pipelines: The section reviewed 233 applications for pipeline projects in the province, a decrease of 91 from the previous year. Of these, 19 applications required development and reclamation approval under the Regulated Oil and Gas Pipeline Surface Operation Regulations. This represented a decrease of 21 from the previous year.

Sand and Gravel Section: The Sand, Gravel, Clay and Marl Surface Operations Regulation A.R. 228/82 was enacted in 1982. Under this regulation, all large sand, gravel and clay operations on patented land in the province require a development and reclamation approval.

An inventory and notification program to record all operations and to notify the landowners and holders of a gravel lease of the regulation requirements was continued during the year. The program will continue until all operations on patented land have been recorded and all active operations have received development and reclamation approval.

In 1986-87, the program focussed on six municipalities which contained 327 gravel operations, of which 77 required development and reclamation approval. To April 1, 1987, 1,689 pit operations have been recorded in 36 municipalities with 568 requiring approval. The remaining operations were either inactive or were of a minor size which did not require approval.

During the reporting period, 162 applications for development and reclamation approval were reviewed. One hundred and fifty-eight approvals were issued to private developers, counties, Alberta Transportation and Alberta Environment operations. This represents an increase of 35 per cent over the previous year. The sand and gravel referral system reviewed 73 proposed highway projects submitted by Alberta Transportation.

Development and Reclamation Review Committee

The Development and Reclamation Review Committee is an interdepartmental committee established under Part 4 of the Land Surface Conservation and Reclamation Act to carry out detailed technical review of major coal and oil sands development applications. The committee recommends operational terms and conditions for development and reclamation approvals issued by the Minister.

Over the past two years, the department has endeavored to streamline the overall environmental approval process for major energy projects. One significant change has been the designation of the Chairman of the Development and Reclamation Review Committee as the central point for processing and co-ordinating the review of coal mine applications under the Land Conservation and Reclamation Act, the Water Resources Act, the Clean Water Act and the Clean Air Act. Also, in an effort to reduce duplication, the Annual Report Guidelines for coal mines have been integrated to provide industry with the option of submitting information required by both the Energy Resources Conservation Board and the department in one document.

The general downturn in the economy continued to affect both coal and oil sands development; however, several in situ experimental projects did proceed. Development and reclamation approvals were issued to: Amerada Minerals Corporation of Canada Ltd. - Cold Lake Experimental Project; Amoco Canada Petroleum Company Ltd. - Brintnell and Beaverdam Projects; and Mazzei Oil and Gas Ltd. - Frog Lake Oil Sands Scheme.

Applications for amendments to existing development and reclamation approvals made up a large portion of the committee's work load during 1986-87, which resulted in 19 amendments being issued.

Crown Mineral Disposition Review Committee

The committee reviewed 23 schedules relating to coal, oil sands and quartz. Oil and gas leases and licences constituted most of the work load. The schedule format was changed for oil and gas to reflect changes in the size of posting requests. As a result of the review process, 1.7 million hectares were offered for sale by open tender, a decrease from the previous year.

Exploration Review Committee

This committee reviews coal exploration applications referred by the Land Conservation and Reclamation Council.

During 1986-87, the number of programs reviewed and recommended for approval were 17.

ENVIRONMENTAL ASSESSMENT DIVISION

The Environmental Assessment Division develops, maintains and co-ordinates the department's environmental impact assessment (EIA) system and related public participation programs and provides services in remote sensing technology.

EIAs are required for most major resource developments proposed in the province, such as new oil sands mining projects, sour gas processing plants, coal mining projects, power plants, refineries and petrochemical facilities, pipelines, transmission lines, recreational developments and water resource projects.

The division also administers the restricted development area (RDA) regulations which designate transportation utility corridors and areas requiring special environmental protection.

Ministerial Consent is required for most land-use changes in restricted development areas. The RDA regulations are also the basis for implementing the Calgary and Edmonton transportation/utility corridors.

The division also provides environmental advice on applications for subdivision and on a variety of land-use proposals throughout the province.

Community Affairs Branch

The branch continues to be responsible for facilitating public involvement in the regulatory procedures used to determine the balance between environmental quality and resource development on specific projects.

Environmental Impact Assessment: Communities were assisted through responses to requests for information and advice on environmental issues and the regulatory process. Branch staff advised proponents on the requirements for public participation programs and monitored proponent programs for conformity to the intent of the EIA guidelines regarding public involvement.

The branch assisted with citizen involvement in 17 industrial projects throughout the province. These included eight industrial development projects, one coal project, six oil sands projects and two pulp mills.

Branch staff also responded to requests from individuals and community groups planning to intervene at Energy Resources Conservation Board hearings where an EIA was involved in the proponent's applications. Assistance was also provided to a number of advisory committees and special interest groups, with particular

mention to the Community Advisory Committee of Cold Lake, the Genesee Power Project Advisory Committee, the Keephills Steering Committee, the Northeast Calgary Sour Gas Committee, the Quirk Creek Community Gas Plant Committee, the East Parkland Liaison Committee, City of Edmonton Landfill, Northern Alberta Environmental Project, Think Recycle Project and Environment Week.

Departmental Projects: Branch staff aided citizen participation in many departmental water resource projects, including the South Saskatchewan River Basin Study, the Beaver River-Cold Lake Water Management Study, the Whitford Lake Water Management Study, the Forty-Mile Coulee Reservoir Development, the Oldman River Dam, the Milk River Basin Study, the Peace River Basin Water Management Study, the Willow Creek Basin Study and the Hutch Lake development.

The branch was also responsible for liaison with a number of other government branches and departments, and branch staff directly advised and worked on special projects such as the Fort McKay Environmental Education Committee, pipeline development applications and the use of herbicides in forest management.

Environmental Impact Assessment Review Branch

This branch evaluates proposals to determine if environmental impact assessment reports are needed, decides the scope and content of EIA documentation and co-ordinates interdepartmental reviews of these projects.

During the 1986-87 fiscal year, this branch dealt with 53 project reviews, of which 45 were new referrals and eight reviews were carried over from the previous year (see table 15). The branch dealt with a total of 18 major projects, which included carry over projects and new projects. Twelve of these projects required EIAs, consisting of three coal mines, four industrial projects, three major oil sands proposals and two sour gas facilities. Five EIA reviews were completed, five are still active and two were withdrawn by the proponent.

A total of 42 reviews were completed, including projects carried over from last year. Eleven projects are still under review.

**Table 15: New Referrals to EIA Review Branch
April 1, 1986 to March 31, 1987**

Type of Projects	Number of Referrals
Preliminary disclosures	2
Industrial	9
Oil sands	17
Gas development/processing	5
Water resources	2
Coal mines	1
Transportation	1
Pipelines	1
Recreation	4
Other	3
Total	45

Major environmental reviews were completed for the Shell Bearberry Sulphur Recovery Demonstration Project and the DND OH Ranch training facility.

Project specific environmental information requirements were developed for the proposed Bradbury Industrial Group Incorporated chlorophenol facility. The branch also co-ordinated the departmental participation at the ERCB Public Hearing for the Diamond Shamrock sour gas well and Shell Bearberry Demonstration Project and participated in preparation for ERCB hearings for the Norcen and CanOxy gas plant applications.

The EIA Review Branch also co-ordinated departmental activity, in conjunction with the ERCB, to review the ministerial approval requirements for oil sands projects, duplicate reporting requirements and the proposed Oil Sands regulations.

The subsidiary agreement between Canada and Alberta concerning the environmental impact of projects having interjurisdictional implications has been implemented. The branch assisted the director in the exchange of information with Environment Canada on a number of projects having interjurisdictional implications. These exchanges included proposed Department of National Defense initiatives for a training range and proposed route for low-level bomber test flights. Provincial projects having federal implications were also identified. These included a proposed gas processing plant on federal lands. The agreement also acted as a vehicle for the provision of information on the proposed Oldman River Dam as well as other federal and provincial projects.

Alberta Remote Sensing Center

Albertans continued to benefit from the space age technology of remote sensing through the Alberta Remote Sensing Center. The center's facilities and services were used by the provincial and federal governments, private industry, educational institutions and the public for the survey and management of Alberta's natural resources and environment.

The staff, facilities and programs assisted multidisciplinary users in the acquisition, analysis and application of remotely sensed imagery and digital data. The center's Landsat (resource satellite) microfiche collection, imagery library and on-line technical data retrieval system provided

users with current details of Canadian Landsat imagery and of technical documents. High resolution imagery of Canada by the French satellite, SPOT, recorded by Canada's satellite receiving stations, became available to Albertans.

The Image Acquisition and Analysis Section's comprehensive image analysis facilities made available specialized optical and digital analysis equipment and staff assistance for interpreting satellite and airborne data. The Applications Section provided advice and information on techniques for using remotely sensed imagery to meet client needs. The section's Technology Transfer Program co-ordinated specialty courses, seminars, workshops and briefings throughout Alberta and produced technical literature. Center-supported projects demonstrated cost-effective applications of remote sensing techniques in Alberta: Remote Sensing of Ice Jams Using Airborne Impulse Radar; Landsat Thematic Mapper Imagery for Detecting Seismic Lines; Airborne Multi-Detector Electro-Optical Imaging System (MEIS) Data for Sulphur Stress; Snow-pack Depletion Based on NOAA Imagery; Rangeland Assessment Using Landsat Thematic Mapper; and Flood of the Pembina River Using Landsat Imagery.

The center published for distribution "Alberta Remote Sensing Center Review"; "Remote Sensing Winter Wheat Crop Inventory"; "Remote Sensing of Seismic Lines"; "1986 Remote Sensing Newsletter."

Land Use Branch

The Department of the Environment Act (Section 16) provides for the designation of restricted development areas (RDAs) in the province. Thirteen such designations have been made since 1974. The two main reasons for RDA designations are the need for special environmental management in certain areas and for protection of transportation/utility corridor lands. This year, two of the environmental RDAs, Lethbridge and Pinhurst Lake, were repealed, since other land use controls are now in place in these areas. Administration of the remaining 11 RDAs continues to be the responsibility of the Land Use Branch.

Subdivision and development applications and most proposed land-use changes are reviewed to determine whether they conform to the regulations set up for a specific RDA. Ministerial Consent is required before there can be any change in land use.

During the past year, 195 requests for Ministerial Consent were received. Of these, 162 were approved and two did not require consent. The remainder were either awaiting decision, withdrawn or regarded as information. In terms of applications processed, the more active RDAs in the province were those in Calgary and Edmonton (see table 16).

The Land Use Branch is involved in studies related to RDA programs. During 1986-87, a detailed engineering review of proposed City of Edmonton ring road plans continued as a key focus.

The branch also evaluates proposals for subdivisions and for a wide variety of land uses. Comments are provided to local planning authorities throughout the province. In this regard, the branch's objective is to protect high quality agricultural, recreational and high water yield lands, as well as water bodies, from inappropriate usage.

Applications for changes in land use and subdivision are referred to the branch by the 10 regional planning commissions, the Planning Services Division of Alberta Municipal Affairs, the cities of Airdrie, Camrose, Leduc, St. Albert, Fort McMurray, Fort Saskatchewan and Lethbridge, the counties of Grande Prairie, Parkland and Strathcona and the Municipal District of Rocky View.

The branch comments on behalf of the department regarding compliance with the Land Conservation Guidelines, susceptibility to flooding, bank and slope stability, risk of erosion, surface drainage, availability of a domestic groundwater supply, potential air and water pollution and suitability of the soil for sewage disposal.

Branch staff assessed numerous major residential and cottage resort subdivisions near water. Much time was spent with developers, reviewing applications for cottages

and rural developments and pointing out the risks of sewage contamination, erosion due to vegetation removal, overcrowding and over use of the lakes.

In 1986-87, the number of applications processed increased from 1,398 in the previous year to 1,419 (see table 17).

Staff represented the department at Alberta Planning Board hearings on subdivision application appeals by developers.

On December 11, 1986, the Regulated Lake Shoreland Development Operation Regulations were repealed. Of the 15 lakes originally affected, Lake Isle was the last to be subject to these regulations.

Staff also reviewed 11 applications for annexation of rural lands to urban municipalities as a result of referrals from the Local Authorities Board.

Table 16: Ministerial Consents Summary April 1, 1986 to March 31, 1987

RDA	Total Requests	Consent	Refusal	No Consent Required	*P/W/C	Total 1974-87
Blue Ridge	0	0	0	0	0	8
Calgary	58	51	0	0	7	1,155
Capital City Park	16	11	0	2	3	60
Edmonton	50	46	0	0	4	550
Edmonton-Devon	18	14	0	0	4	191
Edmonton-Fort Saskatchewan	22	15	0	0	7	137
Fish Creek	0	0	0	0	0	14
Fort McMurray	7	5	0	0	2	60
Lethbridge	6	5	0	0	1	92
Pinehurst Lake	1	1	0	0	0	3
Sherwood Park West	15	12	0	0	3	112
Strathcona	1	1	0	0	0	8
Turtle Mountain	1	1	0	0	0	11
Total	195	162	0	2	31	2,401

* Pending/Withdrawn/Closed

Table 17: Subdivision Referral Activities

Planning Authority	No. of Applications		Per cent Change
	1985	1986	
Regional Planning Commissions			
Battle River	92	70	24
Calgary	103	147	43
Edmonton Metropolitan	38	65	71
Mackenzie	71	40	44
Oldman River	114	94	18
Palliser	136	130	4
South Peace	28	45	61
Red Deer	175	216	23
Southeast Alberta	30	21	30
Yellowhead	114	139	22
Planning Services Division (Municipal Affairs)	198	147	26
Cities			
Airdrie	1	4	300
Camrose	4	6	50
Leduc	6	3	50
Lethbridge	1	0	100
Fort McMurray	4	0	100
St. Albert	12	6	100
Fort Saskatchewan	1	0	100
Counties			
Grande Prairie No. 1	56	45	20
Parkland No. 31	34	34	0
Strathcona No. 20	14	27	93
Municipal District of Rocky View No. 44	166	180	8
Total	1,398	1,419	2

FINANCIAL STATEMENTS

ALBERTA ENVIRONMENT
SUMMARY OF EXPENDITURES FOR THE 1986-87 FISCAL YEAR

REFERENCE NUMBER	PROGRAM/SUB-PROGRAM ELEMENT	SUB-PROGRAM ELEMENT	PROGRAM TOTAL
01 00 00	Department Support Services		
01 00 01	Minister's Office	\$ 182,348	
01 00 02	Deputy Minister's Office	520,494	
01 00 03	Finance & Office Services	2,014,675	
01 00 04	Systems & Computing	1,766,804	
01 00 05	Policy Planning & Information Services	852,923	
01 00 06	Personnel & Organization Development	609,739	
	Total Department Support Services		\$ 5,946,983
02 00 00	Pollution Prevention and Control		
02 01 00	Program Support	1,107,474	
02 02 00	Air Quality Management	3,645,757	
02 03 00	Water Quality Management	2,280,395	
02 04 00	Municipal Water and Sewage Management	1,826,848	
02 05 00	Earth Contamination	2,531,352	
02 06 00	Waste Management	4,116,657	
02 07 00	Chemical and Pesticide Management	2,140,152	
	Total Pollution Prevention and Control		17,648,635
03 00 00	Land Conservation		
03 01 00	Program Support	117,626	
03 02 00	Land Conservation and Reclamation	3,020,743	
03 03 00	Environmental Assessment	1,925,673	
	Total Land Conservation		5,064,042
04 00 00	Water Resources Management Services		
04 01 00	Program Support	190,088	
04 02 00	Surface Water Development & Control	32,746,376	
04 03 00	Water Resources Administration	11,427,982	
04 04 00	Operation and Maintenance	7,999,656	
04 05 00	Data Collection Inventory	6,855,565	
04 06 00	Water Resources Planning & Co-ordination	4,963,268	
04 07 00	Groundwater Development	3,122,628	
	Total Water Resources Management Services		67,305,563
05 00 00	Environmental Research		3,125,454
06 00 00	Interdepartmental Environment Research & Services		
06 01 00	Program Support	2,538,822	
06 02 00	Plant Sciences	1,609,722	
06 03 00	Chemistry	2,700,172	
06 04 00	Animal Sciences	2,352,535	
06 05 00	Environmental Technology	1,939,762	
	Total Interdepartmental Environment Research & Services		11,141,013
			<u>\$110,231,690</u>

ALBERTA ENVIRONMENT
SUMMARY OF EXPENDITURES AND REVENUES
FOR THE YEAR ENDED MARCH 31, 1987

ALBERTA ENVIRONMENT PROGRAM EXPENDITURES

Departmental Support Services	\$ 5,946,983	
Pollution Prevention and Control	17,648,635	
Land Conservation	5,064,042	
Water Resources Management	67,305,563	
Environmental Research	3,125,454	
Interdepartmental Environment Research & Services	<u>11,141,013</u>	
TOTAL		\$110,231,690

MANPOWER EXPENDITURES ON BEHALF OF ALBERTA ENVIRONMENT

Priority Employment Program (P.E.P.)	333,767	
Employment Skills Project (E.S.P.)	78,783	
Summer Temporary Employment Program (S.T.E.P.)	458,041	
Alberta Environment Employment Program (A.E.E.P.)	<u>94,319</u>	
TOTAL		964,910

HERITAGE SAVINGS TRUST FUND - ENVIRONMENTAL PROGRAMS

Irrigation Headworks Improvement	55,809,011	
Land Reclamation	2,755,009	
Paddle River Basin Development	<u>468,550</u>	
TOTAL		<u>59,032,570</u>

TOTAL ENVIRONMENTAL EXPENDITURES \$170,229,170

REVENUE COLLECTED BY DEPARTMENT

Water Diversion Permits	\$ 3,263	
Water Well Drilling Permits	8,026	
Water Power Rentals	353,992	
Department Miscellaneous	15,380	
Rural Water Development Program	(45)	
Previous Year Refunds	3,950,977	
Industrial Water Diversion	100,397	
Water Resources Revolving Fund	2,407,612	
Mildred Lake	18,725	
McLennan-Girouxville Canal	4,465	
North West Alberta Cost Sharing Program	13,171	
Groundwater Data	2,670	
Land Leases	4,330	
Sheerness Deadfish Creek	45,700	
Forfeits - Plans and Specifications	3,245	
Liquidated Damages	17,782	
Land and Grazing	7,053	
Sale of Land	(231)	
Alberta Environmental Centre - Research	<u>6,550</u>	
TOTAL REVENUE COLLECTED		<u>\$ 6,963,062</u>

WATER RESOURCES REVOLVING FUND

FINANCIAL STATEMENTS

MARCH 31, 1987

Auditor's Report

Balance Sheet

Statement of Operations and Deficit

Notes to the Financial Statements



ALBERTA LEGISLATURE

OFFICE OF THE AUDITOR GENERAL

AUDITOR'S REPORT

To the Minister of Environment

I have examined the balance sheet of the Water Resources Revolving Fund as at March 31, 1987 and the statement of operations and deficit for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1987 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Donald D. Salmon

C.A.
Auditor General

Edmonton, Alberta
June 12, 1987

WATER RESOURCES REVOLVING FUND

BALANCE SHEET

AS AT MARCH 31, 1987

	<u>1987</u>	<u>1986</u>
<u>ASSETS</u>		
Current:		
Accounts receivable	\$ 379,617	\$ 385,355
Materials	258,092	304,291
Prepaid expenses	<u>2,149</u>	<u>2 299</u>
	639,858	691,945
Other:		
Rental equipment (Note 3)	2,917,335	2,925,846
Maintenance and office equipment (Note 4)	<u>55,451</u>	<u>62,175</u>
	<u>\$3,612,644</u>	<u>\$3,679,966</u>
 <u>LIABILITIES AND DEFICIT</u>		
Accounts payable	\$ 161,257	\$ 197,682
Advances from the General Revenue Fund	<u>3,514,140</u>	<u>3,516,247</u>
	3,675,397	3,713,929
Deficit	<u>(62,753)</u>	<u>(33,963)</u>
	<u>\$3,612,644</u>	<u>\$3,679,966</u>

The accompanying notes are part
of these financial statements.

WATER RESOURCES REVOLVING FUND
STATEMENT OF OPERATIONS AND DEFICIT
FOR THE YEAR ENDED MARCH 31, 1987

	<u>1987</u>	<u>1986</u>
Revenue:		
Material and gas sales	\$ 425,307	\$ 307,772
Less: Cost of goods sold	<u>411,782</u>	<u>283,155</u>
Gross profit on sales	13,525	24,617
Equipment rental	<u>1,930,786</u>	<u>1,928,129</u>
	<u>1,944,311</u>	<u>1,952,746</u>
Expenses:		
Operation of equipment	1,096,207	1,159,698
Depreciation	519,930	495,569
Equipment rental	320,896	321,786
Repair and maintenance operations	45,127	43,986
Administration	<u>27,639</u>	<u>30,158</u>
	<u>2,009,799</u>	<u>2,051,197</u>
Operating loss	(65,488)	(98,451)
Gain on disposal of equipment	<u>36,698</u>	<u>25,838</u>
Deficit for the year	(28,790)	(72,613)
Surplus (deficit) at beginning of year	<u>(33,963)</u>	<u>38,650</u>
Deficit at end of year	<u>\$ (62,753)</u>	<u>\$ (33,963)</u>

WATER RESOURCES REVOLVING FUND
NOTES TO THE FINANCIAL STATEMENTS
MARCH 31, 1987

Note 1 Authority

The Water Resources Revolving Fund operates under the authority of the Water Resources Act, Chapter W-5, Revised Statutes of Alberta 1980, as amended.

Note 2 Significant Accounting Policies and Reporting Practices

(a) Depreciation

Depreciation is calculated on a straight-line basis over the estimated useful life of each type of equipment.

(b) Major overhauls

Major overhauls, significantly extending the life of equipment, are depreciated on a straight-line basis over the remaining useful life of the equipment.

(c) Materials inventory

Materials are valued at weighted average cost.

(d) Leases

All leases with respect to the rental and maintenance of equipment, as lessee or lessor, can be cancelled at the end of any fiscal year and are therefore accounted for as operating leases.

(e) Administration and other costs

Salaries, wages, rental charges for the Edmonton, Lethbridge, Grande Prairie and Peace River warehouses and certain overhead costs incurred in the administration of the Fund have been borne by the General Revenue Fund and are not reflected in these financial statements.

(f) Changes in financial position

A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

Note 3 Rental Equipment

	<u>1987</u>	<u>1986</u>
Cost	\$6,355,539	\$5,960,148
Accumulated depreciation	<u>3,438,204</u>	<u>3,034,302</u>
	<u>\$2,917,335</u>	<u>\$2,925,846</u>

Note 4 Maintenance and Office Equipment

	<u>1987</u>	<u>1986</u>
Cost	\$231,927	\$207,309
Accumulated depreciation	<u>176,476</u>	<u>145,134</u>
	<u>\$ 55,451</u>	<u>\$ 62,175</u>

Note 5 Approval of Financial Statements

These financial statements were approved by management.

SURFACE RECLAMATION FUND

FINANCIAL STATEMENT

MARCH 31, 1987

Auditor's Report

Balance Sheet

Notes to the Financial Statement



ALBERTA LEGISLATURE

OFFICE OF THE AUDITOR GENERAL

AUDITOR'S REPORT

To the Members of the Land Conservation
and Reclamation Council

I have examined the balance sheet of the Surface Reclamation Fund as at March 31, 1987. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, this financial statement presents fairly the financial position of the Fund as at March 31, 1987 in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Donald D. Salmon

C.A.

Auditor General

Edmonton, Alberta
July 10, 1987

SURFACE RECLAMATION FUND

BALANCE SHEET

AS AT MARCH 31, 1987

	<u>1987</u>	<u>1986</u>
<u>ASSETS</u>		
Cash (Note 2)	\$1,322,654	\$1,431,458
Securities in trust with the Province of Alberta	<u>218,425</u>	<u>192,925</u>
	<u>\$1,541,079</u>	<u>\$1,624,383</u>
<u>LIABILITIES</u>		
Trust Fund (Note 3)	<u>\$1,541,079</u>	<u>\$1,624,383</u>

The accompanying notes are part
of this financial statement.

SURFACE RECLAMATION FUND

NOTES TO THE FINANCIAL STATEMENT

MARCH 31, 1987

Note 1 Authority

The Surface Reclamation Fund operates under the authority of the Land Surface Conservation and Reclamation Act, Chapter L-3, Revised Statutes of Alberta 1980, as amended. The purpose of the Fund is to hold security deposits received pursuant to the Act as an assurance that satisfactory land surface reclamation will be performed. Since all interest received by the Fund is allocated and subsequently paid to depositors, no surplus or deficit arises on the Fund's operations.

Note 2 Cash

Cash consists of deposits in the Consolidated Cash Investment Trust Fund of the Province of Alberta.

Note 3 Trust Fund

Transactions in the Trust Fund are summarized as follows:

	<u>Cash Deposits</u>	<u>Securities</u>	<u>1987 Total</u>	<u>1986 Total</u>
Balance at beginning of year	\$1,431,458	\$192,925	\$1,624,383	\$2,635,654
Security deposits received	299,622	42,500	342,122	473,855
Interest received	<u>115,243</u>	<u>-</u>	<u>115,243</u>	<u>187,923</u>
	1,846,323	235,425	2,081,748	3,297,432
Security deposits returned	<u>523,669</u>	<u>17,000</u>	<u>540,669</u>	<u>1,673,049</u>
Balance at end of year	<u>\$1,322,654</u>	<u>\$218,425</u>	<u>\$1,541,079</u>	<u>\$1,624,383</u>

Note 4 Bank Guarantees

In addition to the deposits in trust and securities shown on the balance sheet, the Fund held bank guarantees as at March 31, 1987 in the amount of \$61,939,809 (1986 \$52,021,714).

Note 5 Approval of Financial Statement

This financial statement was approved by management.